THE EFFECT OF DEFENSE MANAGEMENT REVIEW DECISION 904, STOCK FUNDING DEPOT LEVEL REPARABLES, ON CASH FLOW WITHIN THE REPARABLE SUPPORT DIVISION OF THE AIR FORCE STOCK FUND

THESIS

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THESIS

Presented to the Faculty of the School of Systems and Logistics

of the Air Force Institute of Technology

Air University

In Partial Fulfillment of the

Requirements for the Degree of

Master of Science in Logistics Mangement

Deborah A. Elliot, B.A.

Captain, USAF

September 1991

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MEMO FOR THE RECORD 15 October 1991

SUBJECT: Amendments to Air Force Institute of Technology Thesis, The Effect of Defense Management Review Decision 904, Stock Funding Depot Level Reparables, On Cash Flow Within the Reparable Support Division of the Air Force Stock Fund (AFIT/GLM/LSM/91S-18)

1. In the Limitations section of the introductory chapter of subject thesis, I stated:

> If RSD operating procedures contained in the Air Force Final Implementation Plan for Stock Funding Depot Level Reparables, DMRD 904, change between the time the [simulation model used in this thesis] is developed and actual final implementation of DRMD 904, model results would become immediately invalid. This would be due to the fact that the thesis model design, used to project certain results, was based on invalid [or different] procedures.

Additionally, if any other sources of information presented inaccurate procedural data during the research process or this procedural data later changed for whatever reason and this data was initially used to construct the simulation model, then the simulation results, likewise, would become invalid. Unfortunately, one of these situations has occurred and it is the intent of this memo to state the problem so that personnel requesting copies of this thesis will not be misled.

2. After final completion of subject thesis, and during a conference with personnel in HQ AFLC/FMBSR, it was determined that one of the major assumptions contained in the simulation model was in error. Due-Out computer transactions do not immediately credit the RSD account with the price of the item ordered, as stated on page 85. This single error has invalidated the model results.

3. Although this error has detracted from the overall usefulness of the thesis and it is recommended that little credence be given to information contained in Chapter 4, Findings and Analysis, there is still an overriding amount of useful information contained in the thesis. Chapters 1 and 2 provide useful general knowledge about the overall functioning of stock funds within the DoD and Chapter 3 could be used as a starting point for future financial simulation work.

4. Key personnel in the primary office for implementing DMRD 904, HQ AFLC/FMBSR, heartily support the conclusions presented in Chapter 5. Additionally, they provided the following clarifications:

> Recommendation 3: There is either a 3 or 5 day "pot of money" at 5AF/FM.
>
> Recommendation 6: There is an initial starting cash balance but it was unclear whether it would be enough to sustain "worst-case" operations.
>
> Recommendation 9: The surcharge will be adjustable but only once a year.

5. I hope that this memo will serve to prevent any misinterpretations of this thesis and that the majority of useful, accurate information contained within it will still be accessed and put to good use.

DEBORAH A. ELLIOT, Capt, USAF
AFIT/GLM/LSM/91S-18

Acknowledgements

I wish to express gratitude and appreciation to the following people for their key contributions to the successful completion of this thesis. First and foremost, I wish to thank my husband, Alan Sorensen, for his supportive and understanding attitude throughout the entire lengthy research process. His encouragement and forbearance throughout this period of personal sacrifice were the single most important ingredients leading to the successful completion of the project. Secondly, the guidance and knowledge provided by the following AFIT professors was significant and is well appreciated: Lieutenant Commander Donald McNeeley, my thesis advisor and computer instructor, and Dr. David Vaughan, a literature instructor who rekindled my desire to write. Finally, although he had no direct involvement in the research process, past work experience with Colonel Robert K. Rassmussen had an indirect influence on the final quality of the research project. Throughout the research, I imagined that the project would have to meet his professional expectations. These, in my mind, included accuracy of information, a level of detail sufficient to convey the main ideas without obscuring them, and a clear, forthright presentation dressed up with graphics as appropriate. Again, I sincerely extend my appreciation to these individuals for their contributions.

Deborah A. Elliot

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I. Introduction

Background

As a result of major budget constraints, the Department of Defense (DoD) was tasked to come up with ways to save money and operate more efficiently while maintaining the same state of operational readiness--to "do more with less." Major world events, including the 1989 fall of the Berlin Wall, coupled with a federal budget deficit in excess of $400 billion, were key forces that prompted these budget constraints.

This situation, in turn, led to the establishment of the 1989 Defense Management Review (DMR) Committee, formed by the Secretary of Defense to identify ways of trimming expenses within the Department. In November 1989, the committee issued 38 decisions designed to improve efficiencies while cutting costs. One of these decisions, DMR Decision 904, Stock Funding Depot Level Reparables, has caused some concerns within the United States Air Force. In a Defense Analytical Study on the problems associated with one division of the Air Force Stock Fund (AFSF), submitted to the Air War College, Colonel Robert K. Rassmussen stated,

> The incorporation of the multi-billion dollar reparable program introduces a significant management problem for the Air Force. ...the stock funding of reparables represents a challenge to the stock fund an order of magnitude greater than the System Support Division problems. (21:66)

Of prime concern is the fact that, by October 1993, unit Organizational and Maintenance (O&M) accounts as well as the Reparable Support Division (RSD) of the AFSF will be used to fund replenishment DLR requirements and, the RSD will be used to fund initial DLR requirements. Initial requirements are projected to amount to a total annual expense of between $500,000,000 and $1 billion (22). Replenishment requirements are projected to amount to a total annual expense of between $1.2 billion and $2.2 billion. Under the pre-DMRD 904 funding method, central appropriation accounts paid for DLR items and, in effect, provided them at no direct cost to hundreds of using organizations scattered throughout the Air Force.

With the implementation of DMRD 904 procedures, a lack of funds within either unit O&M accounts or the RSD stock fund account, would prevent a DLR item from being ordered when it was required--thereby degrading support to the base level customer, the user. This concern becomes amplified further when it is considered that DLR items play a key role in restoring weapons systems to operational capability. They comprise the majority of critical spare parts required in day-to-day maintenance of countless, vital weapons systems.

As a result, base level O&M funds availability as well as RSD division funds availability will become necessary prerequisites for maintaining DLR asset availability. In order to fully support unit DLR requirements, the Air Force

must maintain adequate levels of cash within both of these accounts to meet its expenses and to provide required DLR assets in a timely fashion. What is of concern, then, is the cash flow condition of these accounts.

This thesis will model the RSD division stock fund account and use discrete event simulation to determine if future, projected cash flow within this account will be sufficient to support base level DLR requirements. The details of this methodology are contained in Chapter Three. More detailed, introductory explanations of events described above are presented in the remainder of this chapter.

Overview

A Call for DoD Budget Cuts. Recent yet historic world events have had strong impact on DoD policies which, in turn, have had and are expected to continue to have great impact on the operational activities of the military services (19:22).

> As democratic protesters took hammer and chisel to the 'Iron Curtain' under the passive gaze of soldiers from both the Soviet Union and its most steadfast Warsaw Pact allies, experts in the Pentagon felt many of the underpinnings of the United States's own defense structure begin to tremble. (19:22)

These "tremblings" stirred the Office of the Secretary of Defense (OSD) to direct the implementation of many programs and policies aimed at cutting costs and improving operating efficiencies in light of massive defense drawdown projections (2:6). The defense budget, like the Berlin Wall, was falling.

In his article entitled "Rethinking Defense," James Kitfield states that many perceive there should have been an immediate and significant "peace dividend" resulting from the reduced threat in central Europe. Some members of Congress, notably Senator Les Aspin, agreed. In fact, Aspin proclaimed that "...1990 was the last of the Cold War defense budgets..." (19:23).

In conjunction with the historic changes in Europe, United States Congressmen were struggling with demands of the Gramm-Rudman-Hollings amendment aimed at reducing the federal deficit. As a result, DoD programs were already under severe fiscal scrutiny. Senators and Congressmen alike suggested ways to trim expenses within DoD.

In June 1990, Senator Sam Nunn, Chairman of the House Armed Services Committee, "decided to try his own hand at drafting a defense strategy attuned to the times," which he believed would save up to $255 billion in budget authority (7:4).

Clearly, the DoD had to pull in its spending reins; the public and Congress called for it and current world events seemed to support a reduction in requirements.

<u>DoD's Response</u>. In July 1989, the Office of the Secretary of Defense (OSD), at the direction of newly inaugurated President Bush, initiated the Defense Management Review (DMR) process. This process, headed up by the DMR committee, had many similarities to the "1985 Blue Ribbon

Commission on Defense Management, more commonly known as the Packard Commission" (2:6).

> A major goal of this initial DMR was to identify savings totaling $30 billion for the period FY 91-95.... Ideas provided in the past by various study groups, the DoD Inspector General, Program Budget Decisions and also the military services themselves, were 'dusted off' and brought up for review. (2:6)

After reviewing and evaluating several proposals, the DMR committee issued 38 decisions with projected savings of $39 billion over a 5-year period (2:7). Of this amount, $21 billion was to come from the logistics area.

Savings within the logistics area were to be realized primarily through improved operating efficiencies, "reducing the cost of the support infrastructure," major multi-service supply depot consolidations, and funding and budgeting changes (2:6-7). DMRD 904, Stock Funding Depot Level Reparables, is a logistics related decision that deals with funding and budgeting changes.

Defense Management Review Decision 904

DMRD 904 directed a major change in the method of funding DLR items. It established the authority to change the method of funding DLRs within the Army and the Air Force from existing funding methods to the stock funding method. Within the Air Force, DLRs will no longer be funded with depot level funds (central procurement appropriations) but with stock fund monies instead. A newly created division of the Air Force Stock Fund (AFSF), the Reparable Support

Division (RSD), will become the new financial management account used to purchase, control, and maintain DLR items.

The activation of this division of the stock fund is projected to increase wing level O&M account obligation authority by an average of $20 to $30 million per year--twice as much as 1990 operating levels (9:10). Additionally, the amount of obligation authority appropriated to the RSD account is expected to amount to approximately $2.5 billion by 1993 (22).

As a result of these major funding changes, DMRD 904 has many operational and management ramifications. Since DLR assets are key to weapons systems operability, the proper management of both wing level O&M accounts and the depot level RSD account will directly bear on the Air Force's mission capability. As stated above, continued, effective management of DLR assets, under the new funding concept, is imperative.

Importance of Asset Availability. This thesis is concerned with the effect DMRD 904 will have on the availability of DLR assets at the base level. Asset availability is defined as the availability of an item when the customer actually orders. If the item is not on hand in supply stocks, asset availability is the immediate capability to backorder or requisition it. Asset availability, a key customer support measure, is normally contained in the base level supply squadron's issue effectiveness rates.

Issue effectiveness, in turn, is primarily dependent on two variables: 1) is the item currently on hand and available to issue? and 2) were there funds available in both the unit O&M and the stock fund accounts to purchase the required item? If the answer to both of these questions is no, issue effectiveness suffers, asset availability is degraded and operational capability is more at risk.

Impact of Funds Availability on Asset Availability. With the implementation of DMRD 904, a lack of funds within either the customer's O&M account or the RSD stock fund account could preclude effective, timely issue of required DLR items. There are several conditions, under the new DLR funding procedures, in which DLR asset availability could be degraded. These conditions did not exist under the previous, central appropriation funding system.

In the first case, under the new funding procedures, the base level customer would be unable to purchase a DLR item even if it were on-hand in base supply if his unit O&M account did not contain sufficient funds for the purchase. DLR assets, previously "free-issued" to base level maintenance customers, will no longer be so under the new procedures contained in DMRD 904. Customers must have O&M funds in their respective accounts in order to purchase DLR assets.

In another case, supply Item Managers at the depot level would be precluded from ordering DLR assets if the RSD stock fund account did not contain sufficient obligation

authority for the purchase even if the customer's O&M account did contain sufficient funds. All base level requisitions are purchased through the supply stock fund. The fund is the doorway through which all DLR requisitions to sources of supply must pass. As such, it is important that the stock fund, in particular, maintain adequate levels of operating capital to support its customer's needs.

In summary, in order to requisition an item that was not on hand in supply stocks at the time it was required, sufficient funds and obligation authority would have to be available in both the customer's O&M account and the RSD stock fund account. With the implementation of DMRD 904, funds management and control, including maintaining adequate levels of cash flow with the RSD account, will become vital in relation to DLR asset availability.

The Research Problem

Funds availability, as stated above, directly affects asset availability. One of the key concepts related to funds availability is that of cash flow. Cash flow, in general terms, is the continual, multi-directional flow of funds out of an account to meet expenses and then back into it as a result of sales or services. Without the timely replenishment of funds flowing back into an account, the account could, at any given point in time, be unable to meet its expenses. The key to proper account management is to

maintain adequate levels of funds within the account to meet all expenses, at all times.

The Specific Research Question. The specific research question, around which this thesis revolves is, "How will DMRD 904, Stock Funding Depot Level Reparables, affect cash flow within the RSD Division of the Air Force Stock Fund?" Answers to this question will, in turn, have implications for DLR asset availability.

Investigative Questions

The main goal of this thesis is to show how DMRD 904 procedures will affect cash flow within RSD division of the AFSF. In order to answer this broad research question, a computer simulation model (designed to reflect the operation of the RSD account after final implementation of DMRD 904) will be used. The simulation model will be the main instrument through which the main research question will be answered.

As such, it is important that the computer simulation model accurately reflect the operation of the RSD stock fund account, as it is projected to function after final implementation of DMRD 904. Additionally, it is important that the information, generated by the model, is as accurate as possible. In order to credibly answer the main research question, therefore, questions concerning the computer simulation model's verification and validity must first be answered. It follows, then, that investigation questions

can be grouped according to those that deal with model verification, those that deal with model validity, and those that deal with other, related issues.

Verification Questions.

1. Is the computer model doing what it is intended to do?

1a. Does the model function as the Reparable Support Division (RSD) of the base level stock fund is projected to function after final implementation of DMRD 904?

1b. Are the major elements that will affect cash flow within the RSD contained in the model?

1c. Are the major elements, that will affect cash flow within the RSD, operating in the model as they were designed to operate?

Validation Questions.

2a. Have key personnel, responsible for the implementation of DMRD 904, reviewed the model to ensure that it accurately reflects projected stock fund operations?

2b. Have the model's operating characteristics been reviewed to ensure that they are consistent with information contained in the Air Force's implementation plan for stock funding DLRs?

Other Investigative Questions. After the verification and validation questions are answered, other questions regarding cash levels within the RSD division of the AFSF can be asked. Some of these include:

3. How well will the stock fund support customer DLR purchase requirements after the new funding procedures are incorporated?

4. Will the fund run out of the cash required to pay its various expenses?

5. What potential procedural changes could be made to improve the cash flow condition of the RSD account?

6. Will the funding changes, directed by DMRD 904, actually result in increased operating efficiencies <u>without</u> decreasing readiness, as was the intent of the DMR committee's decision?

Limitations

Since the final phase of DMRD 904 implementation will not occur unit 1 October 1993, measuring future cash flow within the RSD account, as a result of procedures contained in DMRD 904, will be accomplished through the use of a computer simulation model designed to reflect the future operation of the RSD account. Though the model will be indirectly validated, it can not be directly validated since the RSD division in its final form will not exist until late 1993. Additionally, there is no Air Force stock fund division currently in existence that mirrors the future operation of the RSD account. These constraints limit the amount of validation that can be performed.

If RSD operating procedures contained in the <u>Air Force Final Implementation Plan for Stock Funding Depot Level</u>

Reparables, DMRD 904 change between the time the model is developed and actual final implementation of DMRD 904, model results would become immediately invalid. This would be due to the fact that the model design, used to project certain results, was based on invalid procedures.

The final limitation deals with the author's background and qualifications to fully and adequately conduct a research study of the magnitude and breadth this thesis demands. This thesis was the author's first major research effort into areas that were relatively unfamiliar to her--stock funding and depot level funds management. Additionally, her experience with computer simulation modelling, interpretation and analysis consisted of one 8-week Air Force Institute of Technology master's level course of instruction. While these limitations may not have a serious effect on the value of this research effort, they must be acknowledged and noted.

Scope

Funds availability will become important at several levels within the Air Force supply system to adequately support DLR requirements. The main accounts used to support future DLR requirements will be unit O&M accounts and the RSD stock fund account. This thesis, however, will deal only with funds availability projections within the RSD stock fund account.

Stock fund accounts, as they currently function and will continue to function within the Air Force, can act as both a mechanism to control unit spending and as a means of providing the required funding support when authorized to do so. Almost all requisitions are purchased for the customer with stock fund monies, and only reimbursed with unit O&M monies. For this reason, a lack of funds within the stock fund account can be the limiting factor in providing mission support.

Proper functioning of the stock fund account, then, is the key to providing DLR supply support. For this reason, cash flow projections, as a result of procedures directed by DMRD 904, will be limited to the RSD stock fund account.

Conclusion

In this introductory chapter, several topics were discussed. Conditions leading up to DoD budget cuts and DoD's response to these cuts, including the establishment of the DMR committee were covered. In July 1989, the DMR committee issued 38 decisions designed to improve operating efficiencies (cut expenses) while maintaining current levels of operational readiness. One of these decisions, DMRD 904, changed the method of funding Air Force DLRs--the spare parts required to maintain weapons systems readiness.

Both the research problem and the specific research question (How will DMRD 904, Stock Funding Depot Level Reparables effect cash flow within the Reparable Support

Division of the Air Force Stock Fund?) were stated. Investigative questions designed to answer the research question were presented and, finally, the research limitations and scope were addressed.

II. Background and Review of the Literature

Introduction

This chapter reviews relevant literature concerning the most significant environmental aspects expected to influence the implementation of DMRD 904, Stock Funding Depot Level Reparables. Topics reviewed include a short analysis of the DoD stock fund environment, including a discussion of factors affecting changes within the Army, Navy and Air Force stock funds since 1978 and a comparison of their current operations.

Following this comparison, a discussion of the Air Force Stock Fund (AFSF) is presented together with an analysis of its customer support performance at the base level during FY88 and FY89. Previously identified DoD stock fund operating problems, as noted in other research studies, are highlighted and discussed in terms of their potential impact on future AFSF operations.

The majority of the chapter deals with the concept of cash flow, a vitally important aspect of successful financial operations both in the profit and not-for-profit worlds. Civilian cash flow terms are explained and the AFSF is analyzed in terms of its recent cash flow health.

Finally, since simulation is the methodology used in this thesis, a discussion of the general nature of simulation will be presented. In particular, a short discussion concerning the findings and recommendations of a

1987 General Accounting Office report, DoD Simulations: Improved Assessment Procedures Would Increase the Credibility of Results, will be presented.

The Stock Fund Concept

Within DoD, there are 5 major stock funds. They are the Navy, Army, Air Force, Marine Corps and Defense Stock Funds. While each of these funds varies greatly in organization and management philosophy, they all share the same underlying principle. They are all "revolving, working capital funds" (15:4-5).

Stock Funds as Working Capital Funds. Working capital funds are one of DoD's financial management systems under its overall Resource Management System (RMS), which was established in 1966. The RMS was "...designed to improve the financial system at all levels" within DoD (17:2). In their Air Force Institute of Technology (AFIT) Master's Thesis entitled, "DoD Resource Management Systems: System for Management of Inventories (Working Capital Funds)," Captains Fulton and Foster state:

> A working capital fund is a revolving fund established to finance inventories of supplies and other stores, or to provide working capital for industrial-type activities. One section of the National Security Act, as amended, authorized the establishment of such funds within the Department of Defense and led the way to more effective control and accounting for the cost of programs and work performed. (17:2)

Working capital funds can be considered a subset of the RMS and are one of several financial management systems used to fund DoD material requirements. What makes a working

capital fund unique is that it is operationally designed to merge fiscal and operating responsibility under the control of a single manager.

To illustrate the concept of merging fiscal and operating responsibility under a single manager, consider the following scenario. A manager prepares a budget, receives the budgeted funds, and then uses these funds in support of his particular operational taskings. This same manager has physical control over the assets he has purchased. He has prepared the budget (fiscal responsibility) and has control of the purchased assets (operating responsibility).

Under financial management systems other than working capital funds, a manager might be responsible for budgeting, buying and accounting for items that are actually used by and in the possession of another agency. In these systems, the agency or unit who has actual physical possession of the item has no real fiscal responsibility for it (17:1-4).

One of the primary advantages of working capital funds, as stated above, is that they tie together fiscal and operating responsibility under the control of a single manager. Based on the success of similar financial control systems used in the civilian sector, DoD established its working capital fund system so that "a more businesslike relationship" would be created at the operating level (17:4).

Stock Funds as Revolving Funds. In addition to being working capital funds, stock funds are also considered revolving funds. As explained in DoD Directive 7420.13-R, Stock Fund Operations, revolving funds involve:

> ...a funding concept that allows the use of funds received from the sale of items or services to customers to acquire assets for resale to customers. For example, a stock fund sells parts to a customer and uses the funds collected from the customer to pay for parts acquired to restock its inventory. (12:C-2)

Basically, stock funds begin operation with an initial starting balance of operating cash and obligation authority. Assets within the fund include a) all inventory on hand, b) inventory in transit that has been paid for, and 3) remaining cash in the account. Stock fund managers rely mainly on the sales of on-hand inventory to replenish their stocks and to order new items. A stock fund's cash balance, alone, is insufficient to support customer requirements. If customers did not purchase the stock fund's on-hand inventory, the fund would soon be depleted as a result of its cash expenditures, used to purchase new items from vendors.

The revolving nature of the stock fund is one of its most significant aspects in relation to supply supportability. A healthy account depends heavily not only on adequate sales, but also on the right sales in order to remain solvent. Though on hand inventory is considered an asset and adds to the stock fund's cash balance, unwanted or obsolete in-stock inventory is of absolutely no value. In

fact, it results in not only a dollar loss to the fund but also a waste of warehouse space and a reduction in the amount of capital available for the fund to reinvest to meet changing customer needs.

From 1953 to 1960, DoD stock funds experienced many problems and appeared to be operating at a substantial loss due precisely to this problem of unusable, obsolete inventory.

> A circumstance which contributed rather heavily to the problems experienced (by the stock funds) was the substantial amounts of materiel left over from World War II and the Korean Conflict. These materials were consolidated within the established service stock funds, and, because of the rapid pace of technological advances, they became obsolete and excess to foreseeable requirements. As a result, they were filtered out of the inventory and either sold at a tremendously reduced rate or donated outright to educational or other public institutions. Thus, the stock funds were or seemed to be operating at a loss until these excesses were removed from the inventories. (15:22)

Another aspect that relates to the stock fund's revolving nature and directly impacts fund solvency is the timely and adequate infusion of funds, as budgeted and planned for by the stock fund manager. When the sales of on-hand inventory is not sufficient to maintain the fund, money must be provided to revitalize it.

Throughout any given fiscal year, stock fund managers prepare and update operating budgets based on projected requirements and past fund performance and submit these budgets through channels to the Office of Management and Budget (OMB) for review and approval (17:16). When and if

approved, the actual infusion of required money into the stock fund travels a long, non-direct path before it finally reaches the stock fund account. The entire process involves the request for, approval of, and receipt of stock fund operating cash.

> Each quarter, HQ USAF must request apportionment from the Office of Management and Budget (OMB) through the Office of the Secretary of Defense (OSD) for stock fund divisions under apportionment control. Upon receipt of the apportionment, HQ USAF provides allocations to the appropriate divisions. The division manager then provides operating targets to MAJCOMS and separating operating agencies for distribution to their retail outlets (i.e. Base Supply) (17:18).

In summary, the stock fund is both a working capital and a revolving fund. The stock fund system was established to create a more businesslike operating environment within DoD and to align both fiscal and operating responsibility under a single manager. The revolving nature of the fund requires not only a certain number of sales but also the right sales. A good stock fund manager will purchase just enough (not more than enough) of the right stock in anticipation of timely customer sales. Lastly, the timely and adequate infusion of operating cash into the fund is required to maintain solvency and adequate customer support levels. When proper and controllable inventory management, coupled with the adequate and timely infusion of funds into the account occur, stock funding, as a financial management system, works well in support of DoD requirements (21:65-69) (9:iii-iv) (17:67-69).

Army, Navy and Air Force Stock Funds--A Comparison

Since their inception, the Army, Navy and Air Force stock funds have been the subject of both severe criticism and extensive praise. There were times when the stock fund's performance appeared substandard and other times when it appeared highly efficient. In all cases, the fund's performance was a function on both the amount of excess, unwanted inventory it possessed and the timely infusion of required funds into the account to adequately support continued operations.

Throughout the years, the service stock funds have undergone many changes--some implemented by the services themselves and others directed by OSD. In many cases, when changes were directed by OSD, the impetus for these changes could be traced back to General Accounting Office (GAO) reports critical of current operations. The GAO, with a critical eye on government spending, has diligently and intently watched over stock fund operations since the establishment of the stock fund concept within DoD.

When the GAO published its 1978 report entitled, "Millions of Dollars Can Be Saved by Improved Management of Aircraft Carrier Inventories," which discussed some of the Navy's inventory management problems, the report quickly caught the attention of not only senior Navy leadership, but Congress and OSD as well. GAO highlighted the lack of a viable unserviceable item tracking system within the Navy

and the resulting financial inefficiencies (24:78-221). Many of these unserviceable items, commonly known as repair parts, cost hundreds of thousands of dollars each.

Soon after the GAO report was released, "the Vice Chief of Naval Operations directed that a study be conducted to evaluate alternative funding mechanisms for secondary item Depot Level Reparables (DLRs) and to develop a formal Navy position on stock funding DLRs" (13:1-1). This study, "Stock Funding Shipboard DLRs," was performed on repair parts managed by the Navy Ships Parts Control Center (NSPCC) and involved non-aviation DLRs only. It was hoped the new financial management system for these items (stock funding) would help provide a better, more businesslike financial environment resulting in more efficient and economical use and control of resources (14:1-1 to 1-2).

<u>All DoD Stock Funds are not Created Equal</u>. In 1969, Captains Elwell and Stanovich wrote in their AFIT Master's thesis, <u>The Standardization of DoD Stock Fund Operations Using the Vertical Stock Fund Management Concept</u>, "Each of the military services presently conducts stock fund operations in a different manner and, apparently, for different reasons" (15:9). Since 1969, this situation has not changed. Organizational and operational control of stock funds varies widely among the services.

Although stock funding has been used in the Navy since 1893, DoD did not really encourage or direct its use within the other services until 1947, with the establishment of the

National Security Act. Shortly thereafter, the newly created Air Force established its stock fund operation and, in 1952, the Army followed suit. "By 1953, all of the services had stock funds at the retail level of supply" (15:21).

The major differences between service stock fund operations can be classified in terms of organization, operation, and management philosophy. The service stock funds were created by each service to support peculiar material requirements and operational taskings. Senior leadership's management and control philosophy, service missions themselves, and each service's organizational structure have molded the organizational and operational structure of the stock funds as they exist today.

The Army, Air Force and Navy each organized its stock fund differently. Although each service stock fund is broken down into separate operating divisions, the number of divisions per service fund and their organizational structure differ. The Army established its stock fund divisions to be consistent with its command structure. The Army has one fund for each of eight major commands. The Air Force established its stock fund divisions by type of commodity. For example, medical and dental supplies are managed under the Medical-Dental Division. DLR reparable items are now managed under the Reparable Support Division. Within the Air Force, there are currently eight different stock fund divisions. The Navy established its stock fund

system under the direction of one of six separate bureaus that were "responsible for technical control over assigned types of material" (5:9). This bureau was the Bureau of Supplies and Accounts (BUSANDA), and it had:

> technical responsibility for all supply functions within the Navy for warehousing, issuing and shipping of all supplies, and for all supply functions of the Navy supply system. ...Other technical bureaus...direct and advise supply activities with respect to technical matters, thus cutting across the management control lines of BUSANDA. (5:9)

The BUSANDA bureau allotted Navy stock funds to the Navy's various Inventory Control Points (ICP), who managed respective individual stock fund accounts. Though the BUSANDA bureau has since been abolished and control of the Navy stock fund was transferred to the Naval Supply System Command, stock funds are still managed by the Navy's ICPs.

Horizontal versus Vertical Concept of Operations. Within any of the service stock funds, one or more dispersed operating activity may or may not be part of a particular stock fund division. For example, the System Support Division (SSD) of the AFSF operates at the wholesale, intermediate, and base levels of supply. These dispersed operating activities are part of the same division and, for accounting purposes, are treated as one unit. Even though these supply activities are geographically separate, in effect they constitute one stock fund unit. Because of this, the SSD of the AFSF exemplifies the vertical concept of stock fund operations. In the vertical concept of operations, the fund is expensed once, for the purchase of

an item, and credited once, upon its sale (8:170-171). Figure 1 illustrates this concept.

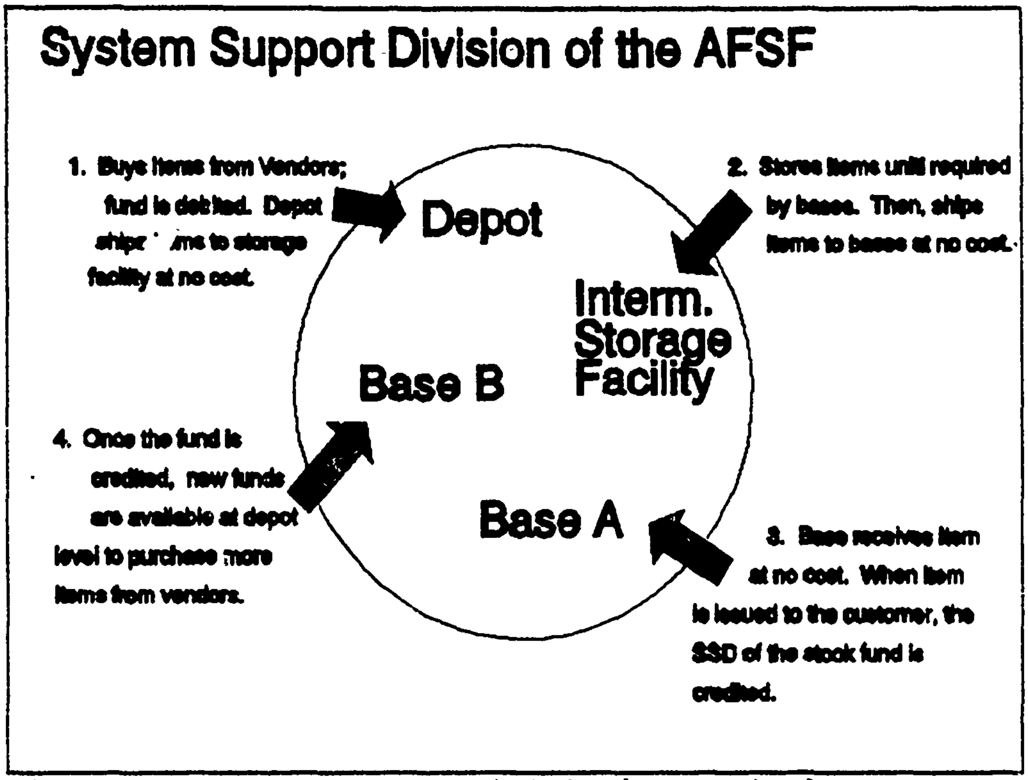

Figure 1, System Support Division's Vertical Nature

The second major concept of stock fund operations is the horizontal concept. Under the horizontal concept of operations, <u>each</u> operating activity pays for items received and is reimbursed for items sold (8:170). In general, if there are different levels of operating activities within a given division and items are bought and sold each time they move from one activity to another, the fund is operating under the horizontal concept. Under the horizontal concept of operations, each operating activity, in effect, has its own set of books.

Within the AFSF, the General Support Division (GSD) is a simplified example of the horizontal concept of operations. This division operates only at the retail of supply. It purchases items directly from vendors and is credited when items are sold to customers. Though it exists only at one level of supply, it does keep its own set of "in-house" books.

The Air Force and Navy funds generally pay for an item only once with stock fund monies, regardless of how many levels of operating activities items travel through. Their stock funds tend to follow the vertical concept of operations (15:55,76). In contrast, the Army fund pays for items a minimum of 2 times--once when the wholesale level purchases it from the vendor and again when the retail level purchases it from the wholesaler. For accounting purposes, each dispersed activity within the same division is considered a separate, unique activity. The Army stock fund follows the horizontal concept of operations (15:55).

Navy Turns the Tide Towards Mandatory Stock Funding of DLRs. From 1978 to 1989, there has been a move within the DoD towards funding DLR items through the service stock funds. This has been due, in large part, to the positive results of two Navy studies on stock funding DLRs. The first study, on the feasibility of stock funding shipboard DLRs, was directed by the Vice Chief of Naval Operations in 1978.

The study began in 1981 and continued for two and one-half years in the controlled environment of the Navy Ships Parts Control Center (14:1-2). The study's objectives were to "determine if operational readiness could be improved and economies achieved by shifting the financing of Non-Aviation DLRs from the appropriated accounts to the Navy stock fund" (13:i). The results of this test were highly positive. Unserviceable item return rates, system material availability rates, and response times for high priority requisitions all improving substantially. This test concluded that all system performance indicators showed improvement under stock funding procedures.

It is interesting to note at this point, however, that the highly positive results associated with stock funding could have resulted from the increased level of funding provided by DoD during the test period. The Navy test occurred "immediately following the relatively poor funding climate of the 1970s" and was fully funded throughout the test period (13:i). A substantial increase in funds availability could have, by itself, resulted in the improved system performance ratings. As a result of this first Navy DLR test,

> the Defense Resources Board (DRB) directed the establishment of a Task Force...to review the stock fund financing of DLR issues...and to provide recommendations to the DRB by October 1983. (13:i-ii)

Prior to this time, both the Army and the Air Force had conducted feasibility studies of stock funding DLR items.

In 1979, the Air Force conducted its first of three separate studies on the merits of stock funding DLRs. This first Air Force study concluded that no substantial benefits would be realized by changing funding methods (14:i). This conclusion was based partially on the fact that the Air Force did not have a problem tracking and maintaining accountability of its unserviceable items, as the Navy had, and preferred the current appropriated funding system that was already in place (14:37).

In 1983, prior to the DRB deadline to review "stock fund financing issues," the Air Force conducted a second study which resulted in the same conclusion as the first. This second study "recommended that the Air Force should not adopt the stock funding concept" (10:1).

In 1982, the Army Material Command (AMC) conducted a similar study and, as a result of its findings, recommended the Army implement stock funding of DLRs. The Department of the Army, however, did not implement the AMC's recommendation (11).

In November 1983, the Secretary of Defense decided to expand "the Navy test of stock fund financing to include Aviation DLRs" (9:ii). This second, more far-reaching study began in FY85 and its results had implications for both the Army and Air Force. The results of this second, aviation DLR test would determine whether OSD directed the other services to implement the new stock fund financing procedures or not.

Again, the Navy's study on stock funding DLRs reported highly positive results. This was due in part to the near 100% financing of the Navy stock fund during the test period. According to the Navy's evaluation report of this second test,

> Prior to stock fund financing of Aviation DLRs, requirements were funded at an average level of 85%. In the stock fund environment, requirements have been funded at a level of 99% or nearly full funding. Even with significant variations of requirements over time during the three year budget and execution process, the full funding of Aviation DLR requirements have obviously contributed to increased material availability. (13:4-13)

Throughout 1978-1989, the GAO published a series of reports that were related in various ways to the issue of stock funding DLRs. In many of these reports, they called for increased financial accountability, efficiency and economy. The results of the two Navy studies seemed to point towards stock funding as a way of achieving these goals.

As stated in the Chapter One, there was heavy pressure to trim the DoD budgets during this time period. As a result, the DMR Committee was established to determine ways that DoD could operate more efficiently. Partly as a result of the numerous GAO reports and the success of both Navy stock funding tests, DMRD 904, Stock Funding Depot Level Reparables, was issued in November 1989 by the DMR Committee. This decision directed both the Army and the Air Force to establish procedures to stock fund DLRs. The decision states:

> The Navy transferred the management of these items (reparables) to the Stock Fund in the early and middle eighties...This policy has previously been proposed to the other Services. However, the Air Force system for managing these item had been characterized by discipline and visibility, and therefore, they saw no need to change. Although the Army system does not appear to have the same degree of discipline, they have also resisted previous attempts to institute this change in funding policy.
> **However, both Services have now agreed to this change in policy**. (9:A-2)

Current AFSF Operation and Impending Changes

Overview. The Air Force Stock Fund was established as part of the National Security Act of 1947. It was authorized, in part, because of the Navy's success with its stock fund operation through both World Wars. The principle advantages of the stock funding were considered: 1) the creation of a buyer-seller relationship in which the customer justified his budget, not the supplier, 2) customer cost consciousness, and 3) continual inventory replenishment as long as funds were available in the account (21:12-13).

Organization of the Air Force Stock Fund. The Air Force Stock Fund is comprised of 8 divisions, divided generally by the type of commodity provided. Two of these divisions, the Reparable Support and the Cost of Operations Divisions, were established in October 1990 to support DMRD 904 taskings. The other 6 divisions include the Fuels, Commissary, Medical-Dental, Air Force Academy, General Support and System Support Divisions. Figure 2 shows the organization of the AFSF's 8 divisions. Figure 3 shows a breakdown of the types of items the divisions provide.

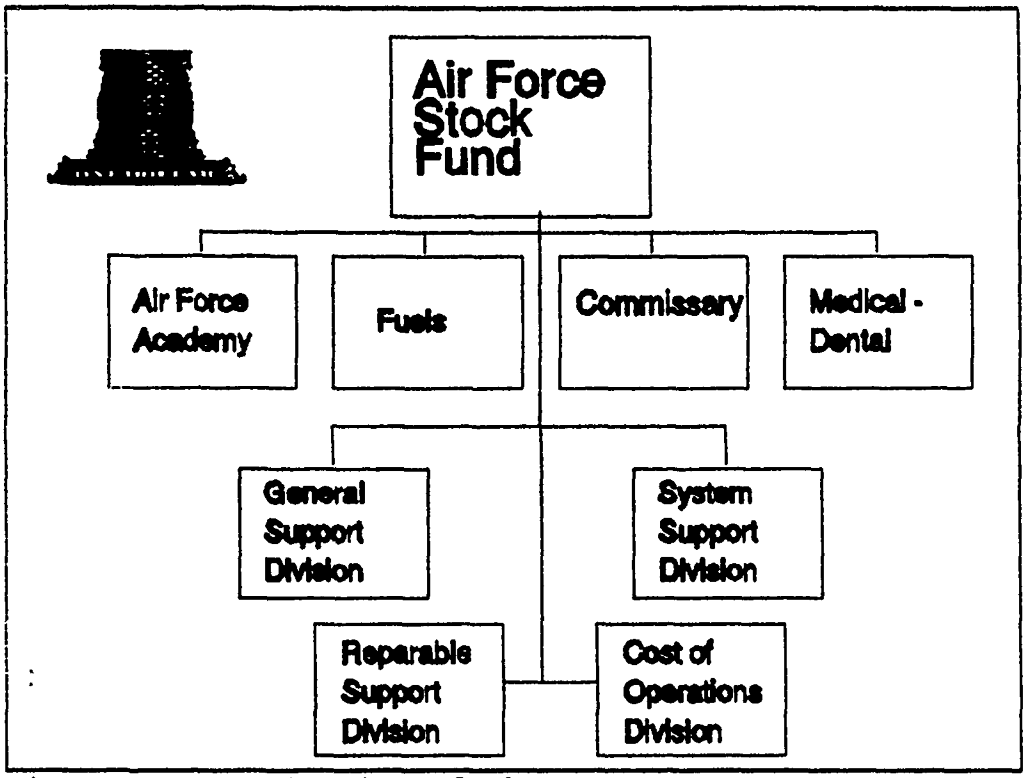

Figure 2, Organization of the AFSF

Types of Items in AFSF Divisions

General Support Division: Retail level, normally small dollar value consumable items -- office, cleaning supplies.

Fuels Division: Bulk petroleum fuels.

Air Force Academy Division: Academic supplies and services for cadets.

System Support Division: Weapons systems spares not repaired at the depot level.

Commissary Division: Food products.

Medical-Dental Division: Medical and Dental Supplies.

Reparable Support Division: Depot Level Reparable Items, commonly called spare parts.

Cost of Operations Division: A "Book-Keeping" Division to oversee wholesale level operations.

Figure 3, Types of Items Stocked in Each Division

Problems Within the Air Force Stock Fund. Though the AFSF account was created with certain benefits in mind, during fiscal years 1986 through 1989, it experienced great turmoil and was unable, at times, to adequately support the base level customer. Within the GSD, problems were identified in four major areas: cash management; accurately budgeting for future expenditures; maintaining a proper balance between obligations (money owed) and demands (customer orders); and a series of disconnects between various data automation support systems. Data automation problems included the questionable accuracy of information, because of computer program errors and disconnects of various types between what should have been similar reporting systems (21:23-35).

Due to these problems, the OSD implemented stringent controls of AFSF management which included limited overall ordering authority, quarterly rather than yearly allowances of ordering authority, and the unilateral withdrawal of each division's authority to transfer funds between and among other divisions to cover unexpected shortages (21:11-21). These controls significantly reduced the base level stock fund manager's flexibility to make timely cash management decisions and negatively impacted stock fund operations.

> ...OSD and Congress contributed to the stock fund's financial woes with reprogramming and restructuring initiatives which diverted cash and interjected new ground rules for financial management. (21:23)

More importantly, these controls "rocked the foundation of the Air Force's base level supply support system" (21:37). During FY89, supply system performance indicators showed that support for both maintenance and support units decreased throughout the Air Force. "Many organizations did not receive material when needed, and workarounds (e.g. cannibalizations) ...increased" (21:41).

Despite these recent operating problems and due, in part, to recommendations from various military, government and civilian management consultants, DoD decided to fund even more items through the stock fund, including the multi-billion dollar DLR assets. Beginning in October 1990, DLR items were funded through one of two new divisions in the Air Force Stock Fund--the Repairable Support Division (9:1-2). Stock Funding is currently viewed, within DoD, as an efficient, cost conscious funding method (21:69).

> The stock funding concept is here to stay--its implementation is being pushed to new limits. To operate effectively within its new boundaries, it needs to be fully understood. Knowledge of the stock fund and many of its intricacies will be essential for resource managers in the 1990s. (21:69)

<u>The Reparable Support Division of the Air Force Stock Fund</u>

The Reparable Support Division (RSD) of the Air Force stock fund, was created in October 1990 in support of taskings contained in DMRD 904, Stock Funding Depot Level Reparables. These taskings resulted in a three-phased, timed implementation plan with major milestones as shown below:

TABLE 1

DMRD 904 IMPLEMENTATION MILESTONES

Phase	Start Date	Action Required
I	1 Oct 90	Stock Fund authority is used to finance procurement of DLRs. OA is used for peacetime replenishment requirements. Congressional appropr. is used to stock fund WRM procurements.
I	1 Jul 91	Stock Fund authority is used to finance depot level repair of these parts. Stock fund obligation authority is used for peacetime parts repair. Appropriated funds are used for WRM repair.
I	1 Oct 91	On hand inventories are capitalized into the stock fund.
II	1 Jan 92	Customers will be required to reimburse the stock fund for parts but reimbursement will be from a centrally managed O&M account.
II	1 Oct 92	The O&M funds will be decentralized and given to each customer. Customers will reimburse the stock fund from their O&M accounts.
III	1 Oct 93	All orders for spares will cite stock fund obligation authority. The stock fund will be paid for initial spares by the central procurement account based on delivery date.

The RSD is the division of the AFSF that will, upon completion of all three phases of the DMRD 904 implementation plan, finance all costs associated with the initial procurement, subsequent replenishment procurement, and repair of DLR items. Both the procurement and repair processes for DLR items are discussed below.

The RSD division will follow a horizontal concept of operations, as defined above. The effectiveness of the management and control aspects of this new and dynamic multi-billion dollar division will impact, indirectly yet significantly, the Air Force's readiness posture.

DLR Procurement. In the procurement arena, there are two general types of procurement processes--initial procurement and replenishment procurement. Initial procurement is defined as a first-time purchase by a depot-level Item Manager (IM) for a given quantity of DLR parts from a commercial vendor. Replenishment procurement is the subsequent purchase or purchases of like parts from the vendor either as required by base level customers or as part of a purchase contract. Both of these procurement processes are illustrated in Figure 4 and described below.

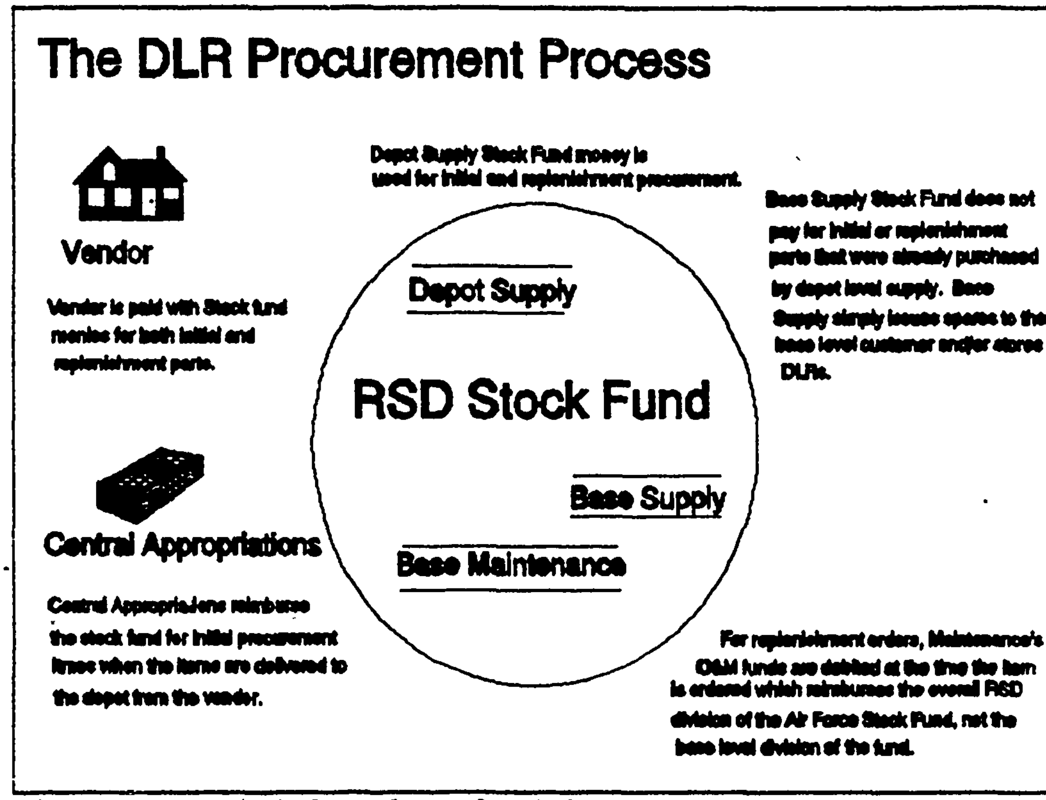

Figure 4, Initial and Replenishment DLR Procurement

Initial DLR Procurement. The initial procurement process can result either from the anticipation of requirements due to the activation of a new weapon system or as a result of first-time orders placed for existing weapon systems. This second scenario is depicted in Figure 5.

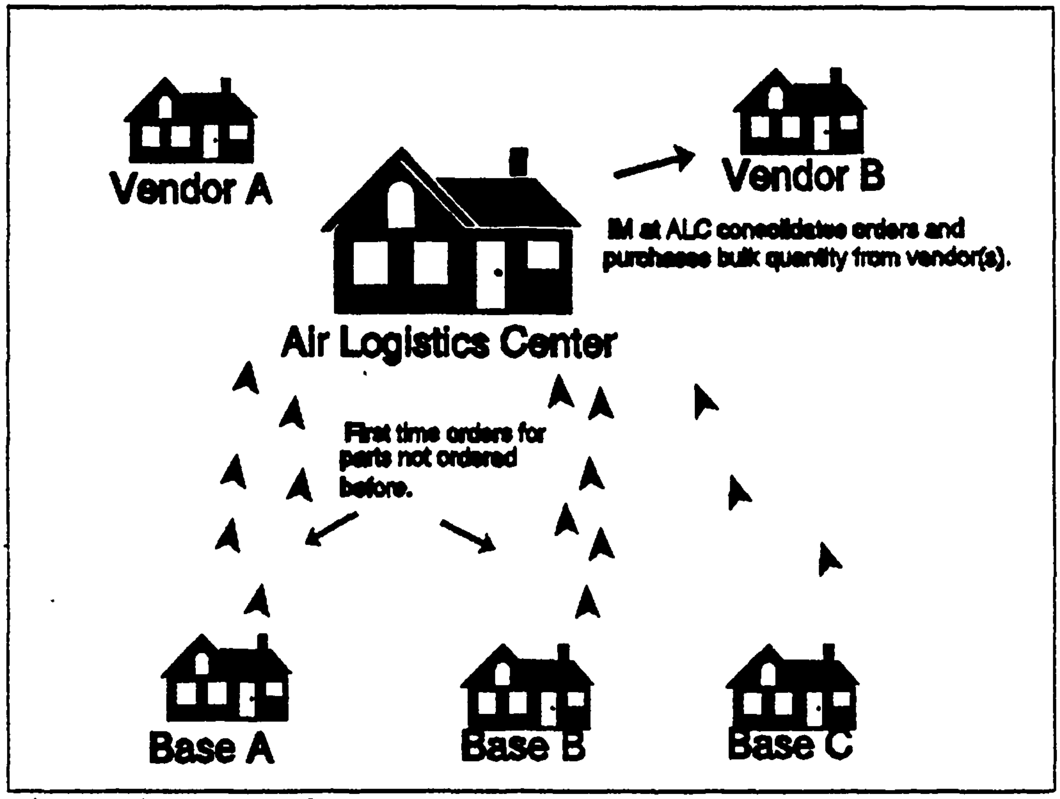

Figure 5, Initial Procurement Resulting from First-Time Orders

In the scenario depicted in Figure 5, any number of base supply squadrons submit initial requisitions to the applicable Air Logistics Center (ALC). The responsible IM at this ALC consolidates all requisitions and makes purchase decisions regarding the vendor to purchase from, the quantity to purchase, and when to purchase. The IM also attempts to negotiate a delivery and production schedule that will best serve the needs of the base level customer and that will stay within RSD funding constraints.

At the time initial procurement orders are contracted, they are fully obligated. The government obligates itself

to pay for these items at a later date. After the vendor produces the parts and delivers them to the wholesale level, the RSD cash balance is expensed and shortly thereafter a central appropriation account reimburses the expensed RSD cash account. If the parts are delivered in increments, the RSD account is expensed incrementally and it is reimbursed by the central appropriation account incrementally.

After the parts are received at the ALC, if there are outstanding requisitions for these parts and other distribution conditions are met, the IM distributes the parts to the requesting base supply squadrons. The parts are then distributed to the base maintenance units who originally ordered them.

Replenishment DLR Procurement. The depot-level IM makes the same type of purchase decisions for replenishment purchases as he/she makes for initial purchases. The difference between the two types of orders is in the way that the purchases are funded and when the RSD account is reimbursed for its original outlay.

Replenishment purchases are also obligated up front and in full with RSD obligation authority at the time a replenishment order is placed for the DLR asset. For replenishment orders, however, the RSD does not have to wait until the parts are delivered to be reimbursed for the money it spends. At the time the base level customer places the order for a replenishment part, his O&M account is debited (decreased) by the cost of the part and the RSD account is

credited (increased) by the same amount. This fund reimbursement process takes place electronically through a network of interlocked computer systems.

DLR Item Repair. For DLR parts, both the wholesale and retail levels will have repair capability but the final level of repair and the authority to condemn a DLR item will be at the depot level. Although most of the repair activity will continue to occur at the depot level, base level repair capability is expected to increase with the full implementation of DMRD 904. This is due, in part, to the costs associated with the repair of DLR parts at the depot level repair facility.

When a unit turns in an unserviceable DLR part, its O&M account is credited (increased) only by the net price of the asset. The net price is less than the full or standard price that the unit originally paid for the part. So, in effect, when the unit turns in an unserviceable part, its O&M account suffers a loss. Though the O&M account gets money for the turn-in, it has paid for the use and breakage of the part by receiving only a fraction of the part's original cost. Standard and net prices are defined in the Air Force Final Implementation Plan for Stock Funding Depot Level Reparables as:

> The RSD will carry two prices--Standard and Net Price... Serviceable items will be sold at standard price and unserviceable items will be sold at net price. Turn-ins will be at standard price for serviceable items and net price for unserviceable items. (9:2-3)

If the base unit could have repaired the part on its own, the only cost that its O&M account would have been expensed would be for the bits and pieces required to repair it. Due to the anticipated O&M savings a unit would experience by repairing more of its own DLR parts, it is projected that base level repair capability for DLR parts will increase. Yet, as stated before, though base repair capability is expected to increase, depot repair will continue to outpace base level repair and handle the bulk of the repair work for DLR parts. The DLR repair process for items repaired at the depot is depicted in Figure 6.

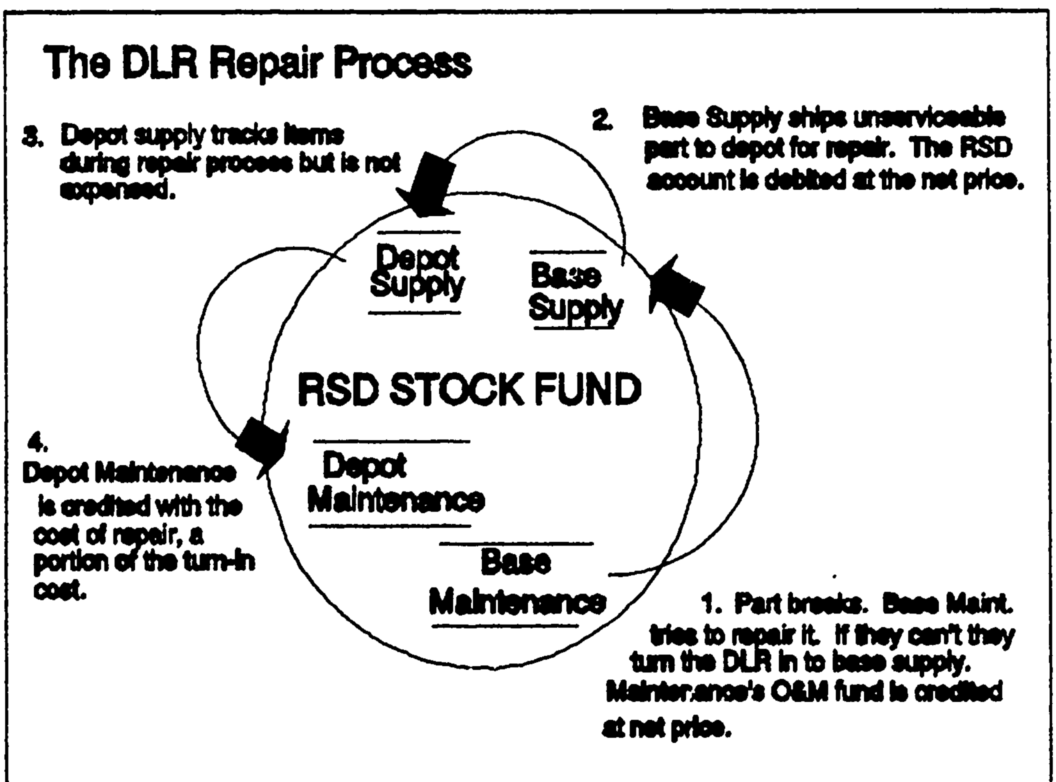

Figure 6, The Repair Process for Items Repaired at the Depot

The Concept of Cash Flow

Although the concept of cash flow is extremely important to private business and, in fact, is the "most common cause of business failure," it is just as important, if not more so within the financial accounts of the DoD (18:7). Although the DoD is a not-for-profit organization and stock fund operations are designed to break even rather than earn a profit, healthy cash flow is vital to stock fund solvency. John M. Kelly, in his book entitled, Managing Cash Flow, defines cash flow as:

> the movement of cash into and out of (an account)...It has to do with the timing of cash transactions and the use of cash as an asset. Cash flow is a process, the way that a company generates and uses its cash... Profit is static. Cash flow, however, is dynamic. Profit is an accounting concept. Cash flow is an operating concept. (18:4-5)

In this definition, Kelly is discussing cash flow in a private, for profit business context. His definition, however, aptly describes the concept of cash flow as it relates to any organization concerned with buying and selling, regardless of whether the business operates in a for-profit or not-for-profit environment.

Cash Flow in Relation to Stock Fund Operations. The importance of the concept of cash flow, as it relates to the stock fund operation, cannot be overstated. Without the adequate and timely flow of cash (obligation authority) into the fund, from a) sales and b) allotments of new obligation authority, the fund would not be able to support customer requirements.

> The primary measure of merit for stock fund management is the amount of cash on hand... The amount of cash...can change significantly due to variations in collections or disbursements. A reduction in demands and accompanying collections can also result in a significant reduction in the stock fund's cash account...if sales do not generate or sales are on the decline, the stock fund's cash position will fall. (21:35-36)

When there is insufficient cash in the fund, serious support problems result. The Navy Stock Fund experienced a "liquidity crisis" during FYs69-70 which resulted in "extremely restricted use of obligational authority" in the early part of 1970 (20:87). During this time assets could not be ordered to meet customer requirements due to a shortage of funds. Insufficient cash flow with the Navy Stock Fund, at this time, also resulted in "inefficient, uneconomic procurement" (20:87). The lack of the required funds when needed, in this case, resulted in higher total costs due to last minute, higher cost purchases.

What is perhaps the worst of all worlds, in relation to stock fund cash flow problems, occurred in the 1960s:

> Although required parts were available at depot facilities the Army's M-48 tankers and the Navy's USS Forrestal were not able to maintain full combat readiness because the "consumer" or operating activity did not possess the funds with which to "purchase" these required parts. (15:24)

In this case, the retail level supply activity did not have the required cash balance in its stock fund account to purchase parts that were available at the wholesale level supply activity. Additionally, even though the base level customer had the funds available in his O&M account, the

items still could not be purchased. As a result of this misalignment of funds between customer O&M accounts and the stock fund account, the fund was unable to support its customer. It is emphasized that this lack of support was caused not by a material shortage but by a financial operating system discrepancy--the misalignment of funds.

<u>Cash Flow Within the RSD of the AFSF</u>. Maintaining sufficient levels of operating cash within the RSD account is a necessary prerequisite to ensuring maximum support of DLR items. With the change from central appropriations funding to stock funding of this new class of item, it will be more important than ever to ensure adequate and aligned funding as well as proper system management. DLR assets are in a class of supply items by themselves. They are the repair parts that restore inoperable weapons systems to a readiness posture. There is no more important category of supply item, except perhaps munitions and maintenance equipment, than spare parts in relation to operational readiness. Degraded availability of DLR assets, due to financial system malfunctions or temporary funding shortfalls, will result in the degradation of the force's readiness posture.

Adequate levels of cash flow within the RSD must be maintained. Adequate levels of cash, however, will be dependent upon a combination of many, dynamic conditions that could occur within the RSD stock fund account at any particular point in time. Most of the basic conditions that

affect cash flow within the RSD account, on a day-to-day basis involve demand patterns and procurement and repair actions. Figure 7 depicts some of these basic, day-to-day transactions and their affect on the operating cash balance within the RSD division of the AFSF.

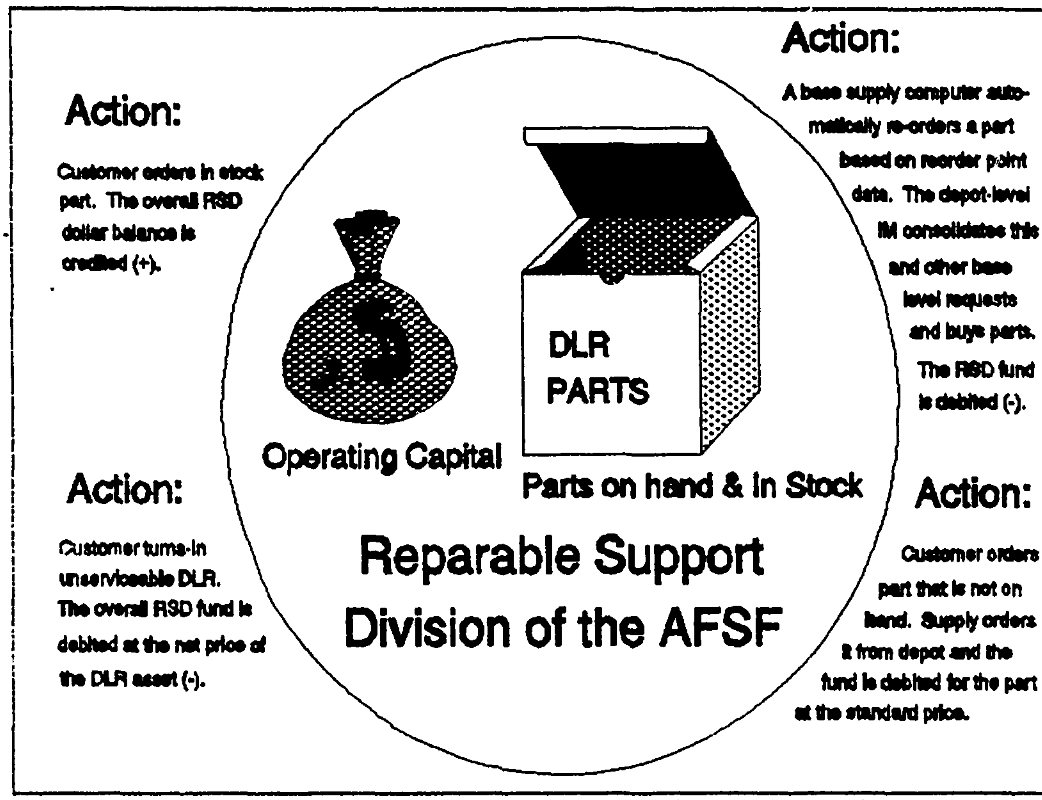

Figure 7, Transactions that Affect the RSD Cash Balance

There are several other factors that could affect cash flow within the RSD of the Air Force Stock Fund in addition to those illustrated in Figure 7. Some of these are listed in Table 2.

TABLE 2

FACTORS THAT COULD AFFECT CASH FLOW WITHIN THE RSD ACCOUNT

FACTOR	EFFECT
Early deliveries of DLR items to the depot.	Decreases cash balance ahead of schedule.
Late deliveries of DLR items to the depot.	Increases cash balance temporarily until items are finally delivered.
The number of customer requisitions in any given time period	A large number of orders for items on hand greatly increase cash balance. Orders for items not on hand decrease cash balance.
The condition of reparable assets turned in.	Cash balance is decreased by all turn-in transactions but is decreased more by serviceable transactions than by unserviceable ones.
The amount of obsolete, excess on-hand stock in the inventory	Inventory that does not sell decreases the cash balance. A large amount of obsolete inventory greatly slows cash flow and stagnates the liquidity of the account.
The number of customer refunds	Greater numbers of refunds result in greater decrements to the cash balance.
The amount of customer refunds	Higher dollar value refunds result in larger decrements to the cash balance.

FACTOR	EFFECT
Computer system problems that skew management data and force incorrect funds management decisions	Results are unpredictable but have the potential to severely and negatively impact the cash balance.
The inability of stock fund managers to accurately predict future of requirements	Could result in either a shortage or excess cash on hand.
An imbalance between customer O&M accounts and the stock fund	Without adequate funds in either account, orders cannot be placed. When there are more funds in one account than the other the account with excess funds tends to stagnate.
Inaccurately capitalizing inventory into the fund because of improper inventory counts, data entry, or computer error	If inventory value is overestimated, real cash position will decrease. If inventory value is underestimated real cash position will increase.
Capitalizing obsolete items into the inventory	In effect, decreases the cash position.
The authorization of a new weapon system	New weapons systems parts that are not budgeted for or funded will decrease the cash balance.
The deactivation of an old weapon system	Excess in stock parts will decrease the real cash position.
Large changes in customer demand patterns	Will make budgeting difficult and could either increase or decrease the cash balance.

FACTOR	EFFECT
Long repair cycle time for items shipped to the depot for repair	Delays the reimbursement of funds to the stock fund and temporarily decreases cash balance.
Heavy and varied deployments with DLR assets deployed as part of the support package	Complicates repair process and demand pattern, making it more difficult to accurately budget for DLR items. Has potential to degrade cash flow due to accountability and inventory problems.

The factors listed in Table 2 are just some of many factors that have the potential to affect cash flow within the RSD stock fund account, some more than others. It is important to remember that any of these factors could occur at any time and in any combination. The result of one set of combinations might be enhanced supply support while the result of another set could lead to total support failure. During the simulation phase of this thesis, some of these conditions will be tested to determine their effect on cash flow.

Computer Simulation--A Method for Projection

In order to project what future cash flow will be like in the RSD account, discrete-event computer simulation was used. It was selected as an appropriate methodology due to its flexibility, its ability to answer a variety of system-related questions and, most importantly, its predictive

ability. According to Guisseppi A. Forgionne, in his book entitled, Quantitative Decision Making, simulation provides a

> useful and convenient management laboratory. The simulation model explicitly identifies the important relationships involved in the actual problem. Managers can therefore use the model to systematically and consistently evaluate proposed policies under a variety of simulated conditions. (16:859)

Although simulation is a flexible and adaptive tool, certain precautions must be taken when using it to ensure accurate and believable results. Guisseppi recommends the simulation designer follow certain guidelines when conducting a simulation study.

He discusses the importance of system flowcharting, properly identifying simulation goals, modeling the system to attain these goals, and limited and careful interpretation of the simulation results (16:857).

He states that flowcharting is "a diagram that shows the sequence of operations and computations required by the simulation model" (16:837). Especially for a complex system, laying out the required, essential operations in a diagram helps the modeler visualize the basic system accurately. For complex systems, it provides a design accuracy checkpoint prior to proceeding on to more detailed modeling. Good flowcharting provides a sound basis upon which to build the system model. It should be the essential first step in complex system modeling (16:838).

Guiseppi goes on to make the point that much extraneous information can be alleviated if the simulation's goals are kept clearly in mind as the model is being developed. The model should be kept as simple as possible, as long as it contains the necessary information required to produce good results (16:840).

Lastly, though simulation is now widely used because of the advancements in computer processing, all results should be carefully interpreted. Guiseppi's recommendation for enhancing the likelihood that a simulation study will be valid and believable are mirrored by Jerry Banks and John S. Carson, II in their book Discrete-Event System Simulation. Banks and Carson's framework for ensuring simulation credibility will be used as the outline for Chapter Three, Methodology. Their ideas are also reflected in a 1987 GAO report on simulation credibility assessment, discussed below.

GAO's Recommendations for Improving Simulation Credibility

In December 1987, GAO published a report, DOD Simulations: Improved Assessment Procedures Would Increase the Credibility of Results. Though the report used certain criteria for assessing the credibility of three simulations dealing with major weapon system acquisition decisions, this same criteria could be used for any simulation dealing with operational effectiveness issues. The report states:

> Our framework appears to be appropriate for reviewing the credibility of simulations of operational effectiveness... we believe our framework provides a structured and useful way to review the credibility of the results of simulations of operational effectiveness. (23:3)

Since RSD division stock fund simulation model (CASHFLOW), developed for this thesis, deals with the operational effectiveness of the stock fund, these criteria should be appropriate for assessing the model's credibility.

The GAO report states that there are three main areas of concern in assessing a simulation's credibility. They include: theory, model design, and input data; the correspondence between the model and the real world; and management issues. Each of these areas will be discussed in greater detail in Chapter Three and presented in the order suggested by Banks and Carson in their book, Discrete-Event System Simulation.

III. Methodology

Introduction

This chapter explains the methodology used to answer the research question: How will DMRD 904, Stock Funding Depot Level Reparables, affect cash flow within the Reparable Support Division of the Air Force Stock Fund? Further, it provides the methodology to answer the two sets of investigative questions presented in Chapter One. The first set of investigative questions deals the with computer model verification issues while the second set deals with validation issues.

As stated in Chapter Two, discrete-event simulation was selected as an appropriate methodology to use to help answer the research question. This selection was based, in part, on the fact that simulation is capable of projecting future system performance based on projected system operating characteristics. Simulation can be used to analyze cash levels within the RSD division of the stock fund after DMRD 904 is fully implemented under varying conditions. For this thesis, a simulation model, named CASHFLOW, was created to analyze cash flow within the RSD stock fund account as it will exist after final implementation of DMRD 904, Stock Funding Depot Level Reparables.

While several different simulation approaches could be applied to the research question, the general approach outlined by Jerry Banks and John S. Carson, II, of the Georgia Institute of Technology, was selected. In their

book entitled, Discrete-Event System Simulation, Banks and Carson outline "...a set of steps to guide a model builder in a thorough and sound simulation study" (3:11). They say there are four phases to a simulation study including 1) discovery or orientation, 2) setting objective(s) and model building, 3) running the model and, 4) implementation. Within each of these four phases, there is a series of steps (3:11-16). These four phases and their respective steps will be discussed as they relate to the simulation model designed to analyze cash flow within the RSD stock fund account.

Phase I--Discovery or Orientation

Though there are potentially several different methods of solving the same problem, certain problems lend themselves more directly to being solved through simulation. As stated above, the research question around which this thesis revolves lends itself to being solved through simulation.

After the researcher determines that simulation will be the solution method, the next step is to research and understand the management problem as completely as possible. From this understanding of the management problem, the basic nature of the simulation model begins to emerge. Banks and Carson consider this process as the first phase in a simulation study and state,

> The first phase, consisting of steps 1 (Problem Formulation) and 2 (Setting of Objective and Overall Design), is a period of discovery or orientation. (3:15)

<u>Step 1--Problem Formulation</u>. The "problem" in this thesis is the fact that management must be aware of conditions that could impair the availability of critical weapons system spare parts--DLRs. Since the decision has been made to finance the procurement and repair of these items through the service stock funds, a look at how the new funding procedures will affect DLR availability is in order. As stated in Chapter Two, stock fund support has varied dramatically since the establishment of stock fund accounts in the DoD. Due to the high dollar value of DLR assets, the financing of these items through the stock fund has the potential to sharply degrade DLR availability under certain conditions.

<u>Step 2A--Setting the Objective</u>. The specific objective of the simulation study is to both answer the research question and to project what affect some of these conditions will have on the RSD division cash flow after the final implementation of DMRD 904. Results of the simulation runs will provide data that could be used to support future stock fund management decisions, geared towards increasing DLR parts availability.

<u>Step 2B--Overall Design</u>. This CASHFLOW simulation model is designed to reflect the essential characteristics of the operation of the RSD division of the Air Force Stock

Fund (AFSF). Modeling this system, however, was a complex process due to the factors discussed below.

First and foremost, the RSD division does not currently exist as it is projected to exist after final implementation of DMRD 904. Under the best of circumstances and pending no unforeseen obstacles, final implementation of the DMRD 904 will not occur until October 1993. For this reason, modeling the RSD system was accomplished primarily through information provided in the Air Force Final Implementation Plan for Stock Funding Depot Level Reparables and from key people working in areas affected by DMRD 904 at what will become the future Air Force Material Command (AFMC). While guidelines for implementing DMRD 904 are contained in the Implementation Plan, these guidelines are often vague and open to interpretation. The Memorandum for Distribution at the beginning of the Implementation Plan states that:

> While the plan provides a definitive framework for the new stock fund, we expect that revisions will be necessary as we progress...This plan is only the first stage in the proactive process of implementation. Your active participation is essential to its successful completion. (9)

Since several aspects of the implementation plan were subject to various interpretations, the CASHFLOW model was developed based not only on information contained in the Implementation Plan but also from information gathered from personal interviews with the affected personnel at what is now HQ AFLC. Major players at the HQ AFLC who have a role in implementing DMRD 904 include financial management,

Requirements Data Bank (RDB), RSD stock fund management, computer systems, and maintenance personnel. Though responsible personnel are actively working on developing systems and implementing some of the procedural changes required by DMRD 904, these tasks must take their place in line with countless other ongoing tasks, which, based on their required completion dates, are often given higher priority.

The second obstacle to effectively developing the CASHFLOW model was the fluid and unstable environment within HQ AFLC. During mid 1991, when the majority of this research was being conducted, numerous Air Force directed organizational changes, modernization efforts, DMR Decision implementations, office relocations and personnel moves were impeding the implementation of DMRD 904.

As a result of the May 1991 decision to consolidate the Air Force Systems Command (AFSC) and Air Force Logistics Command (AFLC) into the Air Force Material Command (AFMC) in 1992, HQ AFLC office symbols changed, offices were relocated, and people have moved. At the same time, a host of decentralized work centers with newly assigned personnel were trying to implement some of the many computer system and procedural changes directed by DMRD 904. This fluid, unstable environment presented a significant obstacle to modeling the system and to collecting the required input data.

The third major obstacle to developing an effective simulation model involved a shortage of DLR-peculiar historical demand data. Although, in June 1991, programs did exist to track and analyze some reparable items, many of these programs were not stratified to reflect Depot Level Reparable data only and included information for all reparable items. Where information on DLRs did exist, it existed in different forms and in short supply. Finally, managers felt that some past DLR demand patterns were not good predictors of future requirements due to the projected mission changes and the general drawdown of the Air Force itself.

Despite these obstacles, enough information was gathered from a variety of sources to effectively model a rough representation of the projected system. The majority of this information was gathered from personal and telephone interviews with HQ AFLC personnel. While the CASHFLOW model may not be able to predict exact amounts that will exist in the RSD account after FY94 or completely accurate dollar amounts of items affecting the account's balance, the model will be able to demonstrate the effect on the future account's overall cash balance as a result of changing input conditions.

The RSD System Itself--General Characteristics. The RSD is one of eight divisions of the AFSF. Since its establishment on 1 October 1990, it has been and will continue to be in a state of transition until at least 1

October 1993, when Phase III of the DMRD 904 implementation process is projected to be complete. The DMRD 904 implementation process is inextricably tied to the establishment of the RSD division. In fact, the RSD division was created specifically for the purposes of helping to implement DMRD 904.

The RSD division operates under a vertical concept of stock fund operations. While supply operating activities that are part of the RSD division exist at several operational levels (depot, intermediate, base) and operating locations (stateside, overseas etc), the RSD division will function as a single accounting unit. As explained in Chapter Two, the RSD division will only be expensed once, for the purchase of an item, and credited once, upon its sale, regardless of the number of different intermediate supply locations the item travels through on its way to the final maintenance customer. For a more detailed description of the operational characteristics of the RSD division, see the section entitled The Reparable Support Division of the Air Force Stock Fund, on page 33 in Chapter 2 of this thesis.

How the CASHFLOW Model Reflects the RSD System. The major activities that affect operating levels of cash within the RSD stock fund account are included in the CASHFLOW model. The RSD division was modeled using the General Purpose Simulation System, GPSS/H, software package, a well-known discrete-event simulation system. With GPSS/H,

> the modeler views the system being modeled from the viewpoint of entities moving through the system. These dynamic entities, called **Transactions**, are envisioned as moving through the system by moving from **Block** to **Block**, where a block represents an action or event that affects the Transaction itself and other entities. The collection of Blocks representing the whole system is called a **Block Diagram.** (4:7)

In the CASHFLOW model, transactions are the major supply system computer accounting inputs associated with DLR assets that either raise or lower the cash balance in the stock fund account. Some of these transactions include turn-ins, issues, due-out cancellations, due-outs, Item Manager (IM) initial DLR purchases, IM replenishment DLR purchases, initial procurement receipts from commercial vendors, depot level repair action, and surcharges added to the cost of DLR items. Though there are several other computer transactions associated with DLR assets, in the CASHFLOW model we are only concerned with the main transactions that will affect the cash balance in the RSD stock fund account. Further, we are concerned only with the balance in the RSD account that will be maintained at the depot level. This is due to the fact that the depot level is, in a real sense, the only location where RSD funds will actually be located and visible.

<u>The CASHFLOW Model's Operating Characteristics</u>. To demonstrate the CASHFLOW model's general operating characteristics, we'll first explain the effect that two different types of computer transactions/inputs have on the RSD account when they are processed into the Air Force

supply system computer network. The first type of transaction used to explain model characteristics is a Turn-In transaction and the second is a Due-Out request. What these transactions are and how they affect the RSD account are explained below.

<u>How the CASHFLOW Model Handles a Turn-in Transaction</u>. One of the transactions that affects the stock fund's cash balance is a Turn-In (TRN) transaction. A TRN transaction normally originates with a maintenance technician at the base level who no longer needs or wants possession of a particular DLR item. If the item is fully operational and can be used for its designed purpose, it is termed "serviceable"; if not, it is termed "unserviceable". The technician, for whatever reason, turns the item in to base supply. There, a TRN input is made into the base supply computer system.

This computer transaction credits (increases) the customer's O&M account by the turn-in price and simultaneously debits (decreases) the RSD stock fund account's cash balance by the same amount. This decrease in the stock fund account's cash balance has an immediate affect on the operating level of cash within the RSD division of stock fund. When the TRN computer transaction is processed, the fund's cash level is decreased and the amount of new purchases the fund is now capable of making is reduced. Although the TRN is processed at base level, the cash balance in the RSD account is debited at the depot

level through the Air Force's supply system computer network. Within the CASHFLOW model, TRN transactions decrease the balance within the RSD account.

How the CASHFLOW Model Handles a Due-Out Transaction. Another transaction that affects the cash balance within the RSD stock fund account is a Due-Out (DUO) computer transaction. This transaction is created when the maintenance technician requests an item that is not on hand in base supply stocks and so must be ordered through one of the five Air Logistic Centers (ALCs).

A DUO computer transaction immediately debits (decreases) the customer's O&M account by the cost of the DLR item. This O&M account debit, which originates with the base supply computer input, travels through several different computer systems before it finally reaches the RSD account at one of the five ALCs. There, it credits (increases) the RSD account balance by the same amount.

At the depot level, this transceived transaction (sent via computer wire from base supply to the applicable ALC) is reviewed by the responsible Item Manager (IM). The DUO request chain for a DLR item, not in stock at the base supply level, is depicted in Figure 8 and flows in the direction of the arrows illustrated in the figure.

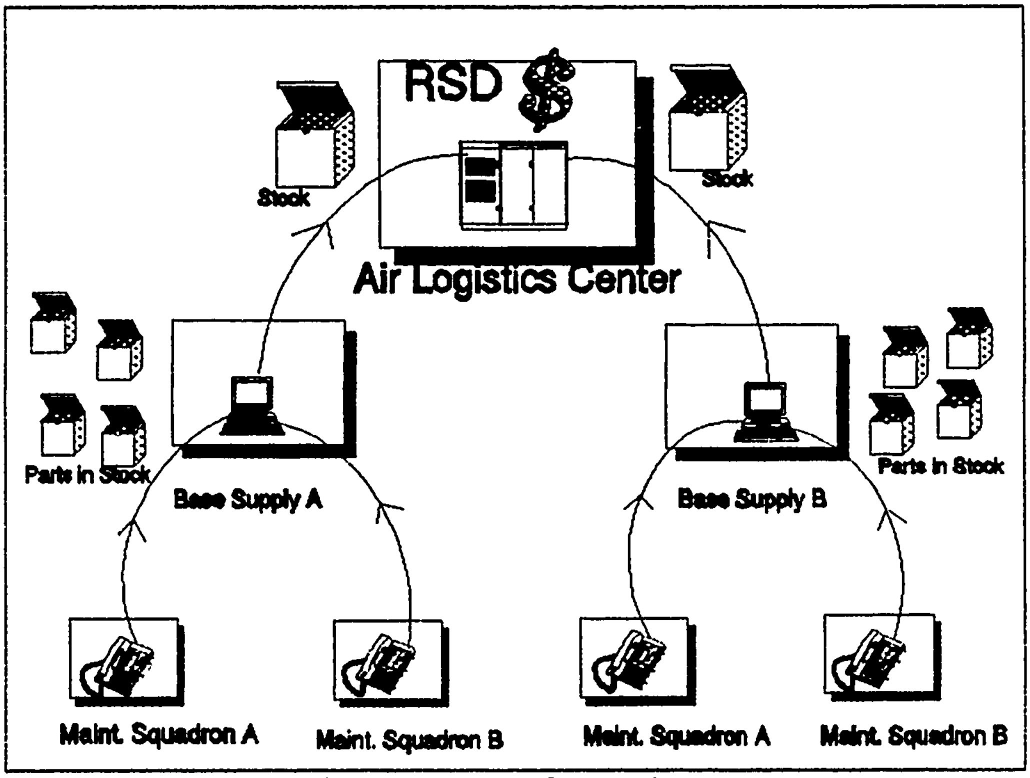

Figure 8, Requesting an Out-of-Stock Part

The IM, at the depot level, is responsible for managing and distributing a limited quantity of DLR assets to bases throughout the Air Force on an urgency of need and a quantity authorization basis. The IM's management responsibilities include making timed purchases from a number of civilian vendors based on both accumulated and projected demands from base customers and the amount of cash on hand in the RSD account with which to purchase the parts. The IM's distribution responsibilities include screening all base DLR requisitions to ensure that filling the requisition will not overstock one base at the expense of another and that the part goes to the base that needs it the most.

If the base has not exceeded its predetermined stockage objective for a particular item and the DLR is in the ALC's stock and there is not a higher priority need for the item at another base, the IM ships the part to the requesting base for distribution to the maintenance customer. In this case, with supply conditions almost perfect, the part is shipped. In many other cases, for a variety of reasons the part may not be shipped when required or at all. If the IM cancels a customer's order, the money originally taken from the customer's O&M account is electronically refunded from the RSD account balance.

The two examples of computer transactions (a TRN and a DUO) and their affect on the RSD account's cash balance demonstrate the basic nature of the system being modeled and some of the general operating characteristics of the model itself. The flow chart, presented in Figure 9 below illustrates, in greater detail, what happens when a part is ordered.

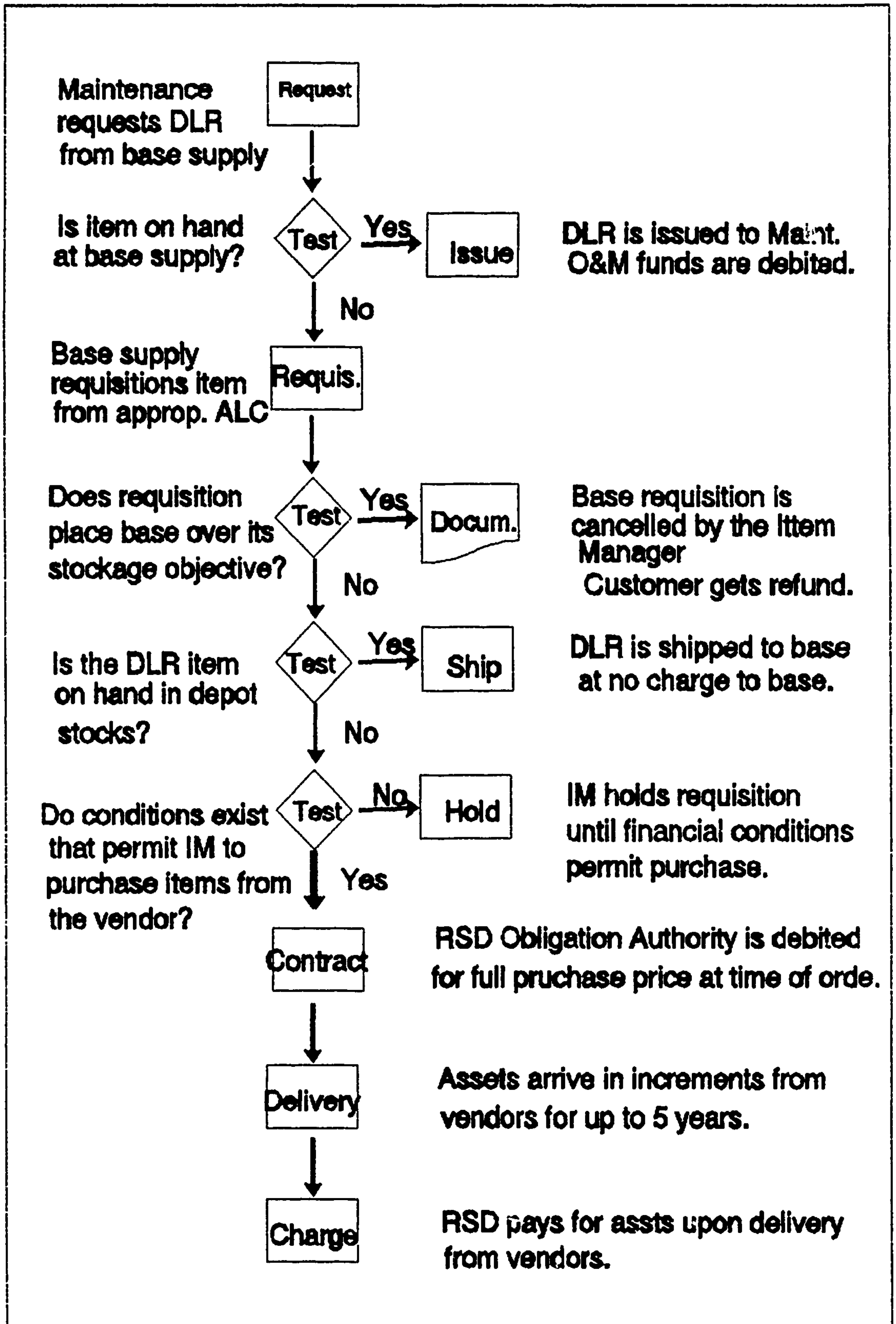

Figure 9, Overview of DLR Requisition Process

Peculiar RSD System Operating Characteristics. Unlike other stock fund accounts within the Air Force, the RSD division account is projected to be completely self-sufficient. In other words, it is expected to generate enough money to pay all of its expenses without requiring annual cash appropriations from OSD. This operating capital is projected to come mainly from surcharges added on to the price of DLR items (22). A DLR asset that costs the RSD account $100 is projected to cost the RSD customer $112. For the CASHFLOW model, assumed baseline figures for FY95 RSD issues and demands total approximately $35.5 billion. The projected income from the surcharges on this amount, then, is approximately $4.5 billion per year.

In addition to the self supporting nature of the RSD division, some of its other system characteristics are peculiar due to the type of assets managed within the division. Unlike consumable items that are issued and forgotten about, continued accountability of reparable assets is a big concern. Unserviceable reparable assets must be turned in, repaired and reissued in a timely manner through an accountability system called the Due-In-From-Maintenance (DIFM) repair cycle process. The proper control and timely repair of reparable assets is required to maintain adequate numbers of serviceable parts. The repair cycle accountability process, though important and required, complicates funding and budgeting requirements for DLR assets.

Two Pots of Money. Within the RSD division, there are two separate and distinct pots of money--Obligation Authority (OA) and the actual cash within the account. OA is the amount of money that can be obligated by RSD managers during a given time frame for procuring initial and replenishment DLRs. Though this is not actual cash, OA is appropriated like cash from OSD through DoD's Biennial Planning, Programming and Budgeting System. IMs have up to three years to obligate these funds.

Cash in the RSD account, on the other hand, is projected to be generated through several different transactions including sales, surcharges, back-orders and central appropriation account reimbursements. Cash in the account is projected to be decreased through payments to vendors for actual deliveries, when orders are canceled or items are turned in, and for depot level repairs. It is the cash balance within the RSD account that the CASHFLOW simulation model is concerned with.

Assumptions. In order to project cash flow within the future RSD account, it was necessary to establish a baseline balance in the account as well as baseline costs and earnings for a given fiscal year. Since the amount of cash expended for the delivery of both initial and replenishment parts is dependent upon the amount of OA obligated, a spreadsheet was used to determine these figures. This spreadsheet is presented in Table 3 below.

PROJECTED RSO OBLIGATION AUTHORITY RECEIPTS, COMMITMENTS, AND CASH EXPENDITURES

Fiscal Year:	Total Obligation Authority Received:	Total Obligation Authority Obligated:	Total Projected Obligation Rates:	Projected Obligation for INITIAL ITEMS	Projected Obligation for REPLEN ITEMS	Total Payments based on Projected Delivery Rates	Projected Delivery Rates:	Projected Payments for Initial Items:	Projected Payments for Replen. Items:
91	$1,500,000,000	$1,050,000,000	70% of 91 OA	$350,000,000	$700,000,000	$798,000,000	7.6% of 91	$26,600,000	$53,200,000
		$1,050,000,000				$798,000,000		$26,600,000	$53,200,000
92	$2,300,000,000	$1,610,000,000	70% of 92 OA	$636,666,667	$1,273,333,333	$262,500,000	25% of 91	$87,500,000	$175,000,000
		$300,000,000	20% of 91 OA			$145,160,000	7.6% of 92	$48,386,667	$96,773,333
		$1,910,000,000				$407,660,000		$135,886,667	$271,773,333
93	$2,600,000,000	$1,820,000,000	70% of 93 OA	$810,000,000	$1,620,000,000	$363,300,000	34.6% of 91	$121,100,000	$242,200,000
		$460,000,000	20% of 92 OA			$477,500,000	25% of 92	$159,166,667	$318,333,333
		$150,000,000	10% of 93 OA			$184,680,000	7.6% of 93	$61,560,000	$123,120,000
		$2,430,000,000				$1,025,480,000		$341,826,667	$683,653,333
94	$2,000,000,000	$1,400,000,000	70% of 94 OA	$716,666,667	$1,433,333,333	$214,200,000	20.4% of 91	$71,400,000	$142,800,000
		$520,000,000	20% of 93 OA			$660,860,000	34.6% of 92	$220,286,667	$440,573,333
		$230,000,000	10% of 92 OA			$607,500,000	25% of 93	$202,500,000	$405,000,000
						$163,400,000	7.6% of 94	$54,466,667	$108,933,333
		$2,150,000,000				$1,645,960,000		$548,653,333	$1,097,306,667
95	$1,900,000,000					$122,850,000	11.7% of 91	$40,950,000	$81,900,000
		$1,330,000,000	70% of 95 OA	$663,333,333	$1,326,666,667	$389,640,000	20.4% of 92	$129,880,000	$259,760,000
		$400,000,000	20% of 94 OA			$840,780,000	34.6% of 93	$280,260,000	$560,520,000
		$260,000,000	10% of 93 OA			$537,500,000	25% of 94	$179,166,667	$358,333,333
						$151,240,000	7.6% of 95	$50,413,333	$100,826,667
		$1,990,000,000				$2,042,010,000		$680,670,000	$1,361,340,000

TABLE 3

SPREADSHEET USED TO PROJECT COSTS

In Table 3, is assumed that the amount of OA received in FY 91 through FY 95 will be $1.5, $2.3, $2.6, $2, and $1.9 billion respectively. Additionally, it is assumed that 70% of a given year's OA will be obligated in the first year, 20% in the second, and the remaining 10% in the third. As shown in Table 3, although the amount of OA received in FY 95 was only $1.9 billion, the amount obligated during this year was $1.99 billion.

From the total amount obligated in a given year, projected expenditures for deliveries was determined. HQ AFLC projects that approximately 7.6% of the total obligations must be paid within the first year, 25% in the second, 34.6% in the third, 20.4% in the fourth, and 11.7% in the fifth (22). Table 3 shows the projected amount of money expended, as a percentage of each year's total obligations. These figures were then summed to determine the total projected delivery costs during each fiscal year. The projected annual payments for initial and replenishment deliveries for FY 95 were used as baseline figures in the CASHFLOW model ($680,670,000 and $1,361,360,333).

In setting up a baseline RSD account, it was further assumed that warranty turn-in costs would be 2% of total sales, cancellations would be 4% of the total items ordered, the dollar value of turn-ins would be approximately equal to items ordered and sold, replenishment procurement costs would be about twice as much as initial procurement costs, and that total annual account credits would equal total

annual account debits. Baseline figures used in the CASHFLOW model are shown in Table 4 below.

TABLE 4
REPARABLE SUPPORT DIVISION BALANCE SHEET FOR FY95

Payments for Initial Deliveries		$680,670,000	Central Appropriation Reimbursements for Initial Deliveries		$680,670,000
YR	$679,670,000	$681,670,000	YR	$679,670,000	$681,670,000
MO	$56,639,167	$56,805,833	MO	$56,639,167	$56,805,833
DY	$1,887,972	$1,893,528	DY	$1,887,972	$1,893,528
Payments for Replen Deliveries		$1,361,340,000	Stock Fund Surcharges		$4,508,761,200
YR	$1,360,340,000	$1,362,340,000	YR	$4,507,761,200	$4,509,761,200
MO	$113,361,667	$113,528,333	MO	$375,646,767	$375,813,433
DY	$3,778,722	$3,784,278	DY	$12,521,559	$12,527,114
Turn-In Costs		$35,000,000,000	Due-Out Demands		$30,000,000,000
YR	$34,999,000,000	$35,001,000,000	YR	$29,999,000,000	$30,001,000,000
MO	$2,916,583,333	$2,916,750,000	MO	$2,499,916,667	$2,500,083,333
DY	$97,219,444	$97,225,000	DY	$83,330,556	$83,336,111
Repair Costs		$2,367,801,200	Issues		$5,531,000,000
YR	$2,366,801,200	$2,368,801,200	YR	$5,530,000,000	$5,532,000,000
MO	$197,233,433	$197,400,100	MO	$460,833,333	$461,000,000
DY	$6,574,448	$6,580,003	DY	$15,361,111	$15,366,667
Warranty Turn-Ins (2% of issues)		$110,620,000			
YR	$109,620,000	$111,620,000			
MO	$9,135,000	$9,301,667			
DY	$304,500	$310,056			
Cancellations (4% of demands)		$1,200,000,000			
YR	$1,199,000,000	$1,201,000,000			
MO	$99,916,667	$100,083,333			
DY	$3,330,556	$3,336,111			
Total Debits:		$40,720,431,200	Total Credits:		$40,720,431,200

Phase II--Model Building

Building the CASHFLOW model itself was based in large part on the availability of actual data that existed or could be projected for input into the model. Detractors to successful model building included the complexity and variability of federal financial systems in operation in June 1991, the disbursed management of various aspects of the DLR program, and data automation system shortfalls. Since building and designing the model resulted, in part, from the availability of data that could be collected or projected, the simulation steps consisting of the collection and analysis of the data and building the model were performed almost simultaneously. Banks and Carson state that:

> The second phase [of a simulation study] is related to model building and data collection, and includes step 3 (Model Building), 4 (Data Collection), 5 (Coding), 6 (Verification) and 7 (Validation). A continuing interplay is required among the steps. (3:15)

Step 3--Model Building. Prior to running the simulation model, the appropriate input data had to be obtained from a variety of sources. This data was obtained from and with the assistance of the HQ AFLC/FMFOM (Financial Management) and HQ AFLC/FMBSR (Reparable Support Division) directorates. Since it was determined that, in most cases, historical data was not a good predictor of future performance, inputs used in the CASHFLOW model resulted from a combination historical data tempered with knowledge about future operating conditions. HQ AFLC personnel who were

best able to project future financial conditions provided dollar value ranges that they estimated these conditions would fall within. A detailed explanation of the method of collecting and analyzing the data required for input into the CASHFLOW model will be discussed in the section titled Step 4--Data Collection below.

The Model Itself. The CASHFLOW simulation model was developed based on the author's understanding of how basic financial transactions would affect cash flow within the RSD account as the account is projected to exist after final implementation of DMRD 904. A block diagram of the model is illustrated in Figure 10 below and then described in detail.

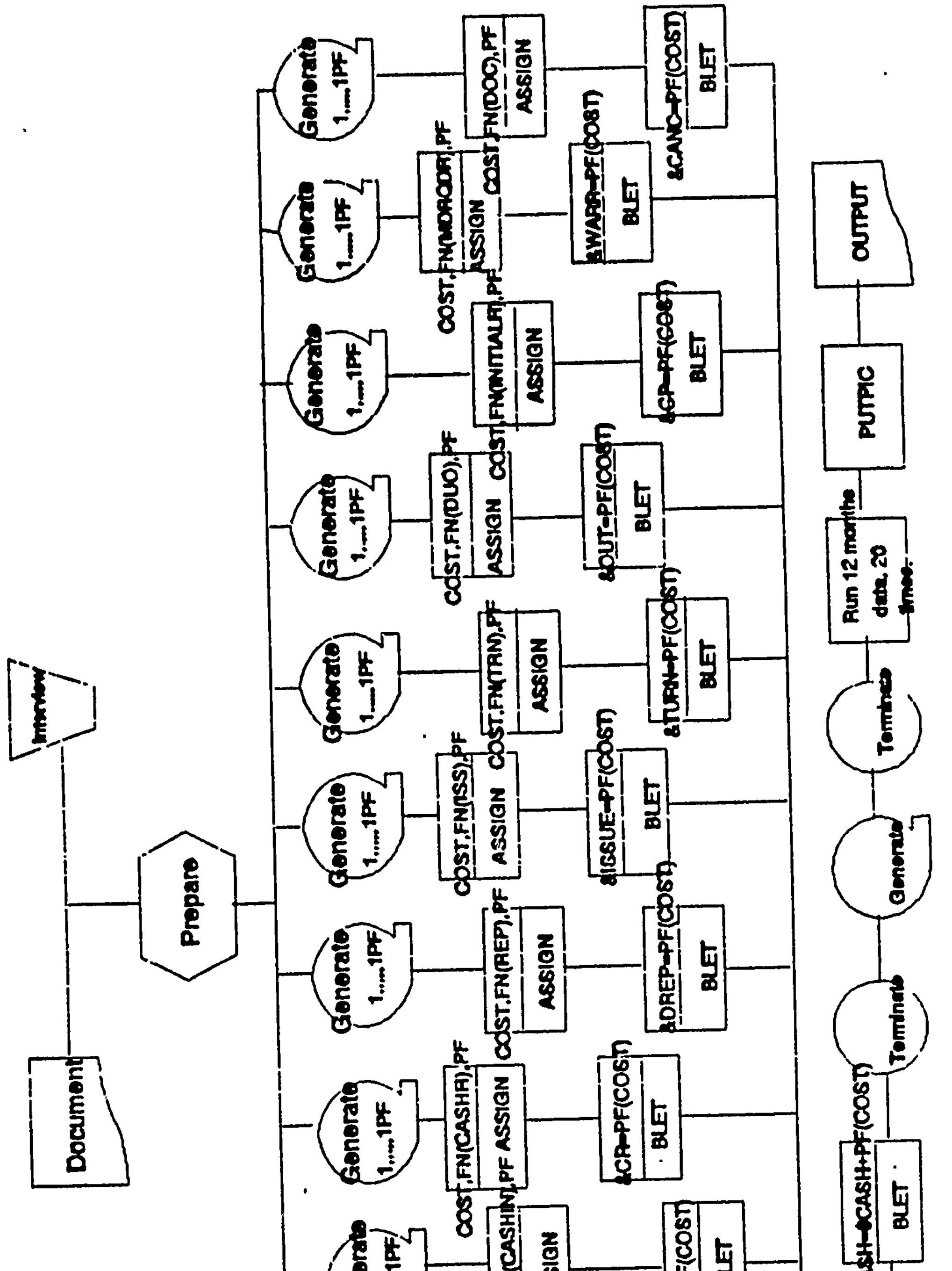

Figure 10, Block Diagram of CASHFLOW Simulation Model

The first two blocks, that are on the same level in the block diagram, consist of a **Document Block** and an **Interview Block**. These two blocks represent the collection of data from supply and financial management listings and from interviews with personnel at HQ AFLC. The next sequential block is the **Prepare Block** which represents an analysis of the data that led to decisions about how to represent it in the model. It also represents actually preparing the data in a consistent form for input into the model.

The next block is a series of ten **Generate Blocks**. These blocks represent each of ten conditions expected to have a significant impact on the RSD account's cash level. Each of these ten **Generate Blocks** generate one transaction that will later be assigned one Full-Word transaction parameter. Each of these ten transactions represent the average daily effect that they are projected to have on the future RSD account. These dollar effects are based on the projected monthly daily dollar value ranges, in Table 4.

Transactions flow from each of the ten **Generate Blocks** to separate **Assign Blocks**. These ten **Assign Blocks** assign a Full-Word transaction parameter called "COST" to each of the generated transactions based on a series of ten individual programming functions, listed in the model's programming code (Note: this programming code is contained in Appendix A).

Transaction parameters are user defined numeric values that are assigned to individual transactions and can

subsequently be accessed for different purposes. In the CASHFLOW model, the transaction parameter "COST," assigned to each of the ten different generated transactions, represents the dollar effect that each of the ten conditions are projected to have on the RSD account. These functions and what they do are explained in Table 5.

TABLE 5

CASHFLOW MODEL FUNCTIONS ARE WHAT THEY DO

Function Name	Purpose
INITIAL	Returns an average daily dollar value expenditure from the RSD account for Initial Procurement DLR items.
INITIALR	Returns an average daily dollar value reimbursement to the RSD account for initial procurement items delivered from the vendor. (Reimbursements come from central appropriation accounts when initial DLR items are delivered)
REPLEN	Returns an average daily dollar value expenditure from the RSD account for Replenishment Procurement DLR items.
REPAIR	Returns an average daily dollar value expenditure from the RSD account for DLR items repaired at the depot maintenance facility.
TRN	Returns an average daily dollar value expenditure from the RSD account for DLR items turned in.

TABLE 5

CASHFLOW MODEL FUNCTIONS ARE WHAT THEY DO
(Continued from Previous Page)

Function Name	Purpose
DUO	Returns an average daily dollar value reimbursement to the RSD account for the establishment of customer orders.
ISS	Returns an average daily dollar value reimbursement to the RSD account for in-stock DLR items issued to RSD customers.
MDRQDR	Returns an average daily dollar value expenditure from the RSD account for defective or deficient DLR items.
DOC	Returns an average daily dollar value expenditure from the RSD account for canceled orders.
SUR	Returns an average daily dollar value reimbursement to the RSD account for surcharges on the cost of items.

The **Assign Blocks** take the dollar values returned from the functions listed in Table 5 and assigns them to each of the nine original transactions generated by the model. This dollar value effect of each of the nine different supply conditions will later be either added to or subtracted from the account's cash balance.

From these **Assign Blocks**, the transactions flow to separate **BLET Blocks**. These **BLET Blocks** assign representative ampervariables to each of the dollar value effects of each of the ten transaction types. The purpose

of this is to provide a way of collecting daily dollar values for each of these effects and later analyzing how each of them affected the RSD account's cash balance. Without the **BLET Blocks** in the model, it would only be possible to collect dollar balances at the time the model was terminated. With the **BLET Blocks** in the model, it is possible to collect dollar balances at the time the model is terminated and to collect dollar balances for each day during a specified time period.

Once transactions have processed through their respective **BLET Blocks**, they flow to an unconditional **Transfer Block**. This block transfers the transactions to a unique and important block labelled "**SCASH**". This block, in effect, is the heart of the model.

The block labelled "**SCASH**" is another **BLET Block** and its purpose is to increment the value currently stored in the ampervariable "&CASH" (a predefined value that reflects the starting balance in the RSD stock fund account) by the value of the "COST" transaction parameter previously assigned to each transaction. Since the dollar value of the "COST" transaction parameter can be either positive or negative, this **BLET Block** results in either an increase or decrease in the cash balance in the RSD account.

This block, which effectively either increases or decreases the cash balance in the stock fund account, is the most important part of the model. It is at this point that

the account's cash balances can be projected and then analyzed based on particular input conditions.

From the **BLET Block**, transactions flow to a **Terminate Block**, which destroys the transactions created by the original generate blocks. This first **Terminate Block** is followed by a **Generate Block** which specifies that the simulation's run time will be measured in time periods rather than in numbers of transactions processed.

From this second **Generate Block**, transactions flow to a second **Terminate Block**. According to Banks and Carson, termination blocks "represent a unit ...leaving the real system and [are] used to decrease the value of the simulation termination counter" (4:27). In the CASHFLOW simulation model, this second **Terminate Block** represents the passing of 1 day's financial activity within the RSD account.

Following this **Terminate Block**, transactions flow to a series of **PUTPIC** statements and what are called **DO LOOPs**. PUTPIC statements tell the computer what type of information to collect and print in another file. This file, called "Balances," stores daily dollar effects and the overall projected daily balances of the RSD account for a period of one year. For more detailed information concerning the operation of PUTPIC statements and DO LOOPs, consult any generic GPSS/H manual.

As the CASHFLOW model is written, it runs and collects data for 12 30-day time frames, one day at a time. Each

30-day period is segregated in the output report by month number. A sample of a section of the output report, contained in the file named "Balances," is shown in Figure 11 below.

SIMULATION OUTPUT (Part A): Projected Reparable Support Division Cash Balances (in Hundreds) For Month Number 1:

Day Number	Initial Procure.	Replen. Procure.	Depot Repair	DLR Issues	DLR Turn-Ins	MDR, ODR & Warr, TRNs	Due Outs Established	Cancelled Items (DOC)	Reimburse. for Deliver.	Credit Surcharge	Total RSD Cash Balance
1	-18882	-37840	-65755	153616	-972225	-3056	833345	-33307	18902	125230	28
2	-18911	-37797	-65788	153664	-972231	-3050	833357	-33360	18880	125215	7
3	-18899	-37793	-65788	153628	-972213	-3074	833318	-33338	18880	125225	-47
4	-18896	-37818	-65751	153612	-972221	-3077	833335	-33306	18902	125236	-31
5	-18901	-37800	-65765	153619	-972234	-3056	833356	-33325	18901	125267	31
6	-18907	-37822	-65796	153646	-972201	-3082	833352	-33344	18906	125217	0
7	-18900	-37795	-65756	153629	-972223	-3070	833336	-33316	18906	125222	33
8	-18899	-37792	-65766	153664	-972244	-3083	833351	-33310	18925	125268	147
9	-18892	-37825	-65789	153639	-972217	-3087	833320	-33321	18922	125224	121
10	-18884	-37798	-65752	153633	-972222	-3093	833306	-33336	18898	125267	140
11	-18918	-37794	-65784	153655	-972232	-3068	833330	-33319	18901	125264	175
12	-18916	-37820	-65762	153625	-972222	-3088	833353	-33321	18898	125262	184
13	-18907	-37826	-65790	153653	-972229	-3048	833336	-33316	18892	125220	169
14	-18911	-37835	-65775	153658	-972241	-3049	833316	-33321	18925	125220	156
15	-18880	-37809	-65770	153622	-972226	-3054	833337	-33333	18919	125259	221
16	-18891	-37795	-65778	153635	-972241	-3058	833324	-33305	18921	125255	288
17	-18912	-37815	-65769	153643	?72223	-3071	833354	-33326	18925	125268	362
18	-18881	-37788	-65782	153624	-972236	-3056	833326	-33355	18924	125219	357
19	-18888	-37793	-65770	153660	-972220	-3075	833338	-33349	18882	125218	360
20	-18911	-37792	-65790	153654	-972232	-3047	833309	-33344	18925	125242	374
21	-18918	-37804	-65777	153617	-972214	-3073	833324	-33326	18883	125232	318
22	-18933	-37821	-65797	153628	-972204	-3089	833358	-33313	18898	125224	269
23	-18903	-37805	-65793	153627	-972200	-3054	833330	-33332	18902	125256	297
24	-18898	-37831	-65795	153658	-972207	-3069	833351	-33330	18895	125261	332
25	-18881	-37811	-65789	153656	-972248	-3084	833346	-33326	18925	125253	373
26	-18929	-37840	-65793	153622	-972216	-3082	833342	-33329	18901	125253	302
27	-18931	-37841	-65768	153653	-972222	-3081	833320	-33331	18910	125270	281
28	-18886	-37820	-65745	153660	-972196	-3069	833344	-33317	18906	125263	421
29	-18915	-37795	-65759	153645	-972198	-3047	833310	-33345	18902	125236	455
30	-18897	-37797	-65765	153621	-972235	-3068	833305	-33327	18899	125259	450

Figure 11, Sample Simulation Output

Simulation models, in GPSS/H, can run for specific lengths of time or until a certain number of transactions have processed. In this model, our goal is to analyze the affect on cash flow within the RSD account during and at the conclusion of 12 consecutive 30-day periods. As explained above, the CASHFLOW model is programmed in time units of 1 day and grouped by 30-day periods. The results of transaction processing during these time periods is then accumulated and saved to an internal system file. A sample segment of this output was shown in Figure 11 above. The data contained in outputs like the one illustrated in Figure 11 will be analyzed in Chapter IV, Findings and Analysis.

Step 4--Data Collection. Required input data for the CASHFLOW simulation model are defined as that data which reflects the basic, substantial transactions expected to impact the cash balance of the RSD stock fund account after final implementation of DMRD 904 in October 1993. From information contained in the Air Force Final Implementation Plan for Stock Funding Depot Level Reparables, DMRD 904 and from information gathered from Air Force Logistics Command (AFLC) personnel responsible for the implementation of DMRD 904, the following transactions were chosen as having the most substantial impact on the RSD's cash balance: Initial DLR procurement action taken by the IM, Replenishment DLR procurement action taken by the IM, Depot Level Repair transactions, Organization and Maintenance (O&M) account reimbursements to the RSD stock fund account for

requisitioned items, Central Appropriation (CA) account (BP1600) reimbursements to the RSD based on initial procurement delivery schedules, surcharges added on to the purchase price of DLR items, base level MDR, QDR, or Warranty turn-in transactions, Due-Out Cancellations, Base and/or Depot Level Turn-in Transactions, and Base and/or Depot Level Issue Transactions. Though there are several other transactions that are projected to impact the cash balance within the RSD account in FY94, their impact was not deemed significant enough to be included in the model. A further explanation of the types of inputs named above is presented below.

Item Manager Initial Procurement Action. The first item expected to have a significant impact on the cash balance within the RSD account is Item Manager (IM) Procurement Action for Initial Procurement DLRs. In this thesis, initial procurement expenditures are defined as the amount of money outlayed or actually spent by item managers for initial DLR spares.

As of June 1991, initial DLR procurements were funded through three major AFLC Budget Programs (BPs): BP 16, used to fund initial aircraft spares; BP 26, used to fund initial missile spares; and segments of BPs 82, 83, and 84, used to fund other initial DLR requirements. There were three separate individuals at HQ AFLC/FMBSR who managed these programs and budgeted for initial DLR requirements. Each of these individuals maintained historical procurement data,

associated with their individual programs, in a somewhat different manner. None of them were required to maintain specific historical numbers of initial DLR assets that were procured and the only data available consisted of the dollar value of spares obligated and outlayed over different periods of time.

Floyd Neuhart, HQ AFLC/FMBSR, who managed the BP 16 initial procurement program for aircraft parts, provided yearly total obligation figures for calendar year 1990 that amounted to $1.2 billion. Alan Arnesen, HQ AFLC/FMBSR, who managed the BP 26 initial procurement program for missile parts, provided obligation figures of approximately $100 million per year. This was the total amount obligated during one year from all applicable and active budget appropriations.

The last three Budget Programs (BPs) for initial procurement spares, BPs 82, 83, and 84 were listed under the heading of "Other" DLR requirements. BP 82 is used for vehicle spares. BP 83, by far the largest dollar value BP of the three in the "Other" category, is used to fund communications, electronic, and computer equipment spares. BP 84 is used to fund any other miscellaneous spares within the "Other" category. According to Marilyn Bowers, HQ AFLC/FMBO, BP 84 is used to fund reparable spares that do not fit into any other category (6).

Unlike BPs 16 and 25, whose Obligation Authority (OA) is restricted solely to initial purchase requirements, OA within BPs 82, 83, and 84 can be used by ALFC personnel to fund both initial and replenishment requirements.

In addition to a shortage of consistent data, initial procurement program managers pointed out that historical data on initial procurement expenditures probably would not be an accurate basis upon which to predict future procurement trends. This was true especially in the missile spares program.

First, the variability of a limited amount of historical data suggested that it would not be a good predictor of future obligation trends. Obligations for the initial missile spares varied from a low of $14,777,943. from FY 89 funds to a high of $57,961,000 from FY 91 funds during one obligation year.

Secondly, the unsteady state of the Air Force itself contributed to uncertainty about future requi. ements. According to Alan Arnesen, Initial DLR Procurement Missile Spares Chief, "the missile procurement arena is currently in a tremendous state of flux, with major programs being phased out as a result of ongoing strategic arms reductions negotiations" (1).

Due to the inability to accurately predict future initial procurement data based on past trends, it was decided that projected initial procurement expenditure input data would be determined by first projecting RSD obligation

authority. As discussed in the section entitled, Assumptions, on page 64, obligation authority projections for FYs 91-95 were the basis for projecting initial procurement expenditures. The projected daily average expenditure from the RSD account for initial procurement items during FY 95 ranges from between $1,877,972 and $1,893,528.

These figures formed the upper and lower values on a uniformly distributed initial expenditure input function in the CASHFLOW simulation model.

Item Manager Replenishment Procurement Action. The second major transaction expected to significantly impact the cash balance within the RSD account is IM Replenishment Procurement Action. Like the IM Initial Procurement Action discussed above, IM Replenishment Procurement Expenditures are currently funded through separate AFLC Budget Programs (BPs): BP 15, for replenishment aircraft spares; BP 25, for replenishment missile spares; and the remaining portion of BPs 82, 83 and 84, for other DLR replenishment requirements.

Historical data reflecting replenishment DLR procurement data was maintained in much the same manner as that for initial procurement data although different personnel were responsible for maintaining it. For the reasons discussed above in the initial procurement section, a uniform distribution was selected as the input distribution for replenishment DLR procurement action also.

The high and low figures for each end of the uniform distribution were also determined in the same manner as those discussed above. These figures, $3,778,722 and $3,784,278, represent the daily average expenditure from the RSD cash account for replenishment orders that are delivered to depots during FY 95. The cost of replenishment procurement has in the past been roughly twice that of initial procurement. Therefore, in the CASHFLOW model, replenishment procurement expenditures are projected to follow this general trend.

Aggregate Depot Level DLR Repair Action. The third major type of transaction expected to have a measurable impact on the cash level within the RSD account is Aggregate Depot Level DLR Repair Action. According to the Air Force Final Implementation Plan for Stock Funding Depot Level Reparables, DMRD 904,

> ...the Depot Maintenance Service, Air Force Industrial Fund (DMS, AFIS) performs organic and contract repair services for its customers. Under the RSD concept, the DMS, AFIS will "buy" serviceable spares from the stock fund...additionally, the RSD will "contract" with the DMS, AFIS for organic and contractual repair of RSD items. (9:4-1)

For the purposes of the CASHFLOW simulation model, the amount of RSD assets the DMS, AFIS' "buys" represent credits to the RSD account while the amount of "returns" (completed repair actions returned to depot supply facilities) represent debits to the RSD account. Within the CASHFLOW model, "buys" are included in either category called "due-

outs" or "issues". "Returns" are included in the category currently being discussed.

The dollar value of DLR assets that are repaired by depot maintenance and returned in a serviceable condition to depot supply is what is being measured in the Depot Level Repair category. DLR assets that are repaired by depot maintenance and returned to the supply system will decrement the cash balance within the RSD account.

Based upon estimates contained in HQ AFLC/FMBSR's FY 92 and FY 93 Budget Estimate Submission, the dollar value of DLRs repaired by depot maintenance and returned to supply is projected to be between $1,300,000,000. and $1,500,000,000. per year by FY 94. For the purposes of the CASHFLOW simulation model, however, the depot level repair costs for FY 95 are projected to amount to $2,367,801,200. While this figure may be a little high, it was necessary to use this figure to establish a baseline RSD account that would conform to the assumptions presented earlier, including the assumption that total credits would approximately equal total debits.

<u>Aggregate DUE-OUT requisitions from Depot and Base Maintenance Units</u>. Due-Out (DUO) requisitions represent the fourth type of supply system transaction expected to significantly impact the cash balance within the RSD account. DUOs represent demands placed upon the supply system by customers for items not currently in stock in supply warehouses. DUOs are sometimes referred to as "back-

orders," since the requested item is not on hand and an order must therefore be sent back to the source of supply. Once a DUO is established, the RSD account is immediately credited with the price of the item being ordered. For this reason, DUO transactions represent a major infusion of funds into the RSD account.

According to HQ AFLC/FMBSR personnel, total demands within the RSD account are expected to amount to between $30 and $35 billion per year. Within the CASHFLOW model for the purposes of establishing a baseline that, again, conformed to the assumptions presented earlier, annual back-orders were projected to amount to $30 billion. Another $5 billion fell into the issue category, discussed below.

<u>Aggregate ISSUES to Base and Depot Maintenance Units</u>. Issue transactions (ISSs) represent the fifth major type of supply transaction that is projected to have a key influence on the level of cash within the RSD stock fund account. ISS documents reflect the issue of on-hand items to customers. Instead of having to backorder an item, due to the lack of stock, the item is immediately issued and results in what is commonly called a "sale". Within the CASHFLOW model, the affect of an ISS transaction is to increase the cash balance within the RSD account. While there is a significant dollar value associated with on hand stock, the existence of inventory does not increase the cash balance of the RSD account until it is actually sold or, in supply terminology, issued.

For the purposes of establishing a baseline FY 95 RSD account, Issues were projected to amount to $5,531,000,000 per year. This annual figure, plus or minus $2 million, equates to average daily credits to the RSD account of between $15,361,111 and $15,366,667. These daily average figures formed the upper and lower values of a uniform input Issue distribution used in the CASHFLOW model.

<u>Aggregate Turn-Ins from Depot and Base Maintenance.</u> Turn-In (TRN) transactions are the sixth major type of transaction that will have a major impact on the RSD account's cash balance. There are a number of TRN transactions, some of which represent the return of serviceable items and some which represent the return of unserviceable items. When reparable items are turned in to supply organizations, they are turned in under various condition codes. Serviceable Turn-Ins (S-TRN) are identified by specific codes including "base repaired" or "depot repaired" on AFLC management listings. Unserviceable Turn-Ins (U-TRN) are identified by terms including "Not Reparable This Station (NRTS)," "Base Condemnation," and "Depot Overhaul (OVHL) Condemnation". When a DLR item is turned-in in an unserviceable condition, the RSD account will be debited by the net price of the item (the standard price minus surcharges). When a DLR item is turned-in in a serviceable condition, the RSD account will be debited at the higher, standard price of the item. While both U-TRN

and S-TRN transactions decrement the RSD account's cash balance, S-TRN transactions decrement it more.

The dollar value of both serviceable and unserviceable transactions was projected to be $35 billion per year. This cost offset the sum of both due-out and issue credits discussed earlier. This figure was compared with figures from the manually compiled RSD portion of the Central Secondary Item Stratification and was found to be reasonably in line with past DLR turn-in costs.

Aggregate Base Level MDR, QDR, Warranty DLR Turn-In Transactions. According to the Air Force Final Implementation Plan for Stock Funding Depot Level Reparables, DRMD 904, Manufacturer Discrepancy Report (MDR), Quality Deficiency Report (QDR), and Warranty Turn-Ins for DLR items will result in a decrease in the cash balance of the RSD account. The plan states that,

> Credit at Standard Price will always be given for an asset returned as an approved Material/Quality Deficiency (MDR/QDR) exhibit or for items under warranty. (9:3-14)

These types of transactions result either from the receipt of new yet defective products at the user level or from items that break while still under warranty. In either case, when the customer turns in the defective DLR item to the applicable supply organization, his O&M account is credited at standard price and the RSD account is debited by the same amount. These types of transactions represent the

seventh type of computer input expected to have an impact on the RSD account's cash balance.

In FY 95, the dollar value of MDR, QDR, and Warranty TRNs is projected to amount to 2 percent of total issues (sales). The annual TRN expense, therefore, that is projected for FY 95 is $110.6 million. This annual figure, plus or minus $2 million, equates to average warranty turn costs of between approximately $305 and $310 thousand per day. Since these TRNs will decrease the balance in the RSD account, they have been entered into the CASHFLOW simulation model MDR/QDR uniformly distributed input function as negative numbers--like all other values expected to decrease the cash balance of the account.

Aggregate Base Level Due-Out DLR Cancellations. Due-Out Cancellation (DOC) transactions are the eighth type of transaction expected to have a significant impact on the RSD account's cash balance. DOCs are generally initiated by the customer for a variety of reasons and result in effectively canceling a previously established order for a particular DLR item. In the CASHFLOW simulation model, DOCs result in a decrease to the RSD account's cash balance. The Air Force Final Implementation Plan for Stock Funding Depot Level Reparables, DMRD 904 states "Due-outs can be canceled at any time. The organization will be credited at obligated standard price" (9:2-4).

Based on the policy contained in the implementation plan, the customer has a great amount of latitude in

canceling orders. In fact, he may do so for a variety of reasons--none of which has to be justified. The customer may simply have ordered the wrong item or ordered the right item then changed his mind. It is projected that customers will also cancel items that have been on order for a long time to replenish their O&M accounts if these accounts are at any time short of money. For this reason, there may be a lot of variability within the DOC area. At present, however, there is no DOC historical data available that would help predict future DOC rates.

Currently, customers do not have to pay for DLR items and so gain no financial benefits from canceling items already on order. For the purposes of the CASHFLOW simulation model baseline data, due-out cancellation rates for FY 95 were assumed to be 4 percent of total demands. This amounted to $1.2 billion per year. This annual cost to the RSD account, plus or minus $2 million, equated to an average daily cost to the account of between $3.331 and $3.336 million. The negative values of these daily average costs formed the upper and lower limits of a uniformly distributed DOC input function.

<u>DLR Item Surcharges</u>. As discussed previously, surcharges will be tacked onto the purchase price of DLR items to pay for the operation of the RSD division and to make it completely self regenerating--a true revolving account. These surcharges, the ninth major transaction affecting the RSD's cash balance, are expected to amount to

12 percent of the purchase price and will automatically update supply computer stock list prices so customers will see one price associated with a given item--the total price including surcharges.

For the purposes of the CASHFLOW simulation model, surcharges are another major source of credit to the RSD account. It is projected that by FY 95, surcharge credits to the account will amount to approximately $4.5 billion per year. This figure equates to approximately 12 percent of the total annual projections for both due-out demands and issues. The total annual projected surcharge for FY 95, plus or minus $2 million, equates to a daily average credit to the RSD account of between $12.522 and $12.527 million per day. These figures formed the upper and lower values of a uniformly distributed surcharge input function used in the CASHFLOW model.

Aggregate Typical Delivery Schedule for Initial and Replenishment Procurement DLR items. The tenth and final type of transaction expected to significantly impact the RSD's cash balance is the aggregate typical delivery schedule for initially procured DLR items. As explained in the sections entitled Initial DLR Procurement and Replenishment DLR Procurement on pages 35-38 of this thesis, the timing of RSD account reimbursements for initial and replenishment procurement actions differ.

While the outlays for both initial and replenishment items will decrease the cash balance in the RSD account as

items are actually delivered to the depot from the vendor, the RSD account will be reimbursed for initial procurement outlays on a different time table than for replenishment outlays.

The RSD account is reimbursed up front for replenishment items from maintenance's O&M account. At the time maintenance customers place an order, their account is debited and the RSD account is credited with the purchase price of the asset. For replenishment items, the money required to pay for deliveries is, in effect, already available in the RSD account.

On the other hand, the RSD account is reimbursed for initial procurement items only after these items are delivered from the vendor. Therefore, the delivery schedule for initial procurement items becomes an important factor in analyzing and projecting the RSD account's cash balance.

Based upon an Air Staff analysis of DLR expenditure patterns, personnel at the AFLC can project what a rough delivery schedule for initial DLR items would look like in FY 94 (22). Within HQ AFLC, the terms "outlay," "expenditure," and "delivery" all typically mean the same thing. After an initial procurement item is delivered, money will be "outlayed" or "expended" from a Central Appropriation account to the RSD account.

It is anticipated that initial procurement items will be purchased up front with RSD dollars and then delivered by vendors at certain rates. These rates are yearly

percentages of total obligated orders that can be expected to be delivered over time and are shown in Table 6 below.

TABLE 6

PROJECTED EXPENDITURE AND DELIVERY PERCENTAGES FOR INITIAL DLR PROCUREMENT ITEMS

Year	Aircraft and "Other" Part Delivery Rates	Missile Part Delivery Rates	Total Projected Delivery Rates
1	7.8%	7.0%	7.6%
2	24.7%	26.0%	25.0%
3	37.2%	26.9%	34.6%
4	17.8%	28.0%	20.4%
5	11.5%	12.1%	11.7%
Total	99.0%	100.0%	99.3%

If, for example, the total initial procurement expenditure for aircraft DLR spares for a given year was $150,000., the dollar amount rate that these items are projected to be delivered in the first year is 7.6 percent of $150,000. or $11,400. The effect this has on the CASHFLOW simulation model is that the RSD account will be reimbursed for $11,400. after the account has already "paid the bill".

An unanticipated lag between RSD account outlays for initial procurement items and the required reimbursement from the central appropriation account due to computer problems or any other reasons could negatively impact the financial health of the RSD account. This reimbursement policy has the potential, under certain conditions, to

severely degrade the liquidity of the RSD account by greatly reducing the account's cash balance over extended periods of time.

Delivery schedules for input into the CASHFLOW simulation model, as shown in the third column of Table 6 above, were calculated as follows. Since aircraft and "other" requirements make up approximately 75 percent of all DLR requirements, the Aircraft and "Other" Part Delivery Rates were weighted by 75 percent, and the Missile Part Delivery Rates were weighted by 25 percent. These weighted figures were then summed across horizontal lines and then divided by 2 to get average delivery rates for all DLR initial procurement items. For example, during Year 1 it is projected that 7.6 percent of the money obligated for initial procurement items will be outlayed by the RSD account and subsequently reimbursed by the central appropriation account.

In the CASHFLOW simulation model, the same amount of money that is outlayed for initial procurement items in a given year is also reimbursed by the central appropriation account. The function entitled "INITIALR" generates daily average reimbursements to the RSD account. These reimbursement values range between $1,877,972 and $1,893,528. These dollar figures, in turn, form the upper and lower limits on a central appropriation reimbursement input function. For the purposes of the baseline CASHFLOW simulation model, it is assumed that central appropriation

reimbursements to the RSD account for initial procurement outlays are made immediately and that there is no lag between payment and reimbursement.

Infusions of Obligation Authority into the RSD Account. Although the dollar value of infusions of Obligation Authority (OA) into the RSD account do not directly impact the cash balance within the account, they do have a significant indirect influence on the account. As stated earlier, the total amount of OA received from OSD determines how much OA is actually obligated during a given year and this, in turn, determines what a typical outlay pattern will look like.

Each year stock fund managers submit Budget Estimate Submissions (BES), listing their anticipated program budget requirements, through their respective chains of command for approval. RSD stock fund managers submit their requirements directly to the Office of the Secretary of Defense (OSD), who in turn submits their BES with a larger package of BES requests through the President to the Congress for final approval. After Congressional funding decisions are reached and disseminated, OSD then grants a certain amount of Obligation Authority (OA) to the RSD stock fund manager.

Although OA is not cash, it can be used like cash. Item Managers use OA to establish contracts with vendors. Once funds within the OA portion of the RSD account are obligated or "pledged" to a vendor as a result of a purchase order, they are in effect spent.

According to Ron Rosenthal, the DLR Requirements Data Bank Lead within the RSD section at HQ AFLC/FMBSR, at the beginning of FY 91 OSD granted the RSD of the AFSF Obligation Authority in two separate categories: one amount for DLR repair authority and one for purchase authority (22). The actual appropriated amounts for FY 91 were $1,378,700,000. for Purchase Authority (PA) and $288,400,000. for Repair Authority (RA). According to Rosenthal, who in June 1991 was preparing the FY 92 and FY 93 RSD Budget Estimate Submission, FY 91 Repair Authority was uncharacteristically low.

Mr. Rosenthal projected that OSD would appropriate the amounts of OA that were requested in the RSD's Budget Estimate Submission for FYs 92 and 93. These amounts are listed in Table 7 below.

TABLE 7

PROJECTED RSD OBLIGATION AUTHORITY FOR FYS 92 AND 93

	FY 92	FY93
Purchase Authority	$1,033,500,000.	$997,400,000.
Repair Authority	$1,322,900,000.	$1,634,400,000.
Total Obligation Authority	$2,356,400,000.	$2,631,800,000.

According to Mr. Rosenthal, even though OA is broken out by repair and purchase authority, monies from either "pot" could be used to establish contracts for other RSD requirements in the event of either a repair or purchase fund shortage. Though this procedure would involve submitting requests to Air Staff for use of the funds for other than their originally appropriated purpose, denial of these requests is not anticipated. Therefore, for the purposes of this thesis, the amounts of OA that were used as guidelines to project future OA amounts, were the Total Obligation Authority figures for FYs 92 and 93 shown in Table 7.

For FY 91, the RSD account received the total amount of its OA up front at the beginning of the fiscal year. It is assumed that the total amount of OA for all subsequent fiscal years will also be received at the beginning of the year in one lump sum. These amounts were discussed earlier and presented in Table 3.

Step 5--Coding. The model was written in General Purpose Simulation Software (GPSS/H) programming code in accordance with instructions contained in Getting Started with GPSS/H, by Jerry Banks, John S. Carson,II and John Ngo Sy. The computer programming code for the CASHFLOW simulation model is contained in Appendix A. For further information on GPSS/H coding, please refer to the above referenced text (4).

Step 6--Verification. Model verification is a means by which the modeler attempts to determine whether the model itself is doing what is it supposed to do. Verification deals with the functional accuracy of the computer program (the model) itself. In this case, the model should accurately reflect changes in the levels of operating cash on hand within the stock fund account as a result of various supply computer transactions dealing with DLR assets. Verification was performed using the GPSS/H debugger function, which enabled the model designer to follow one particular transaction at a time through the model, monitoring it each step of the way. Detailed tracking of a number of transactions showed that the model was functioning properly. This technique, in addition to checking simulation output for accuracy, served to verify that the model was performing as it was designed to perform.

Step 7--Validation. Model validation, according to Banks and Carson, "is perhaps the most crucial point in the entire process" (3:16). It is the process by which the modeler determines whether the model is an accurate representation of the real system that was modeled. In this case, the real system is the RSD account of the Air Force Stock Fund as it will exist after final implementation of DMRD 904.

Model validation is also a very difficult step in a simulation process and one that relates directly to a simulation's credibility. This credibility, as stated in

Chapter Two, can be tied to the theory behind the model development, the model design itself, the accuracy of input data, and the correspondence between the model and the real world.

The theory behind the model development was explained in Chapter One. The idea was that a simulation could be developed to reflect the operation of the future RSD of the Air Force Stock Fund, after final implementation of DMRD 904.

The design of the model was simplified to reflect only the major supply system computer accounting inputs that would have a substantial impact of the cash balance of the RSD account. Daily average dollar value impacts for each of nine different supply conditions were projected and simulated over a 12-month period for periods of 30 days at a time. The experimental design of the simulation runs themselves are discussed in more detail in Chapter Four, Findings and Analysis.

The accuracy of the input data may be the biggest threat to model validity. Due to the lack of historical data reflecting rates on the types of items discussed above and the questionable relationship between the ability of past trends to predict future trends, some of the projected dollar values had to be obtained from HQ AFLC personnel who were best qualified to predict future costs. These personnel included those who prepared, justified, and submitted the Reparable Support Division's FY 92 and FY 93

Budget Estimate Submission that projected these same costs. Other input costs were projected by the author to ensure that all model assumptions could be met. These assumptions were presented on starting on page 64.

Since there is no financial system currently in existence within the Air Force supply system that mirrors the operation of the future RSD division of the Air Force Stock Fund, ensuring that the CASHFLOW simulation model accurately reflects the "real world" (RSD account) as it is projected to exist in FY94 was also difficult. Indirect model validation consisted of a review and analysis of the simulation's documentation by personnel at HQ AFLC. Their comments and recommendations provided the necessary feedback to ensure that, to the greatest degree possible, the model reflected the essential characteristics of the operation of the future RSD account.

Phase III--Running the Model

Phase III, Running the Model. This phase will be addressed in Chapter 4, Findings and Analysis. In Chapter 4, the experimental design of the simulation runs themselves will be addressed as well as the results of these simulation runs.

Chapter IV, Findings and Analysis

This chapter describes the experimental design of the CASHFLOW simulation runs that were used to project future cash flow within the Reparable Support Division (RSD) of the Air Force Stock Fund (AFSF). It explains how and why the runs were performed in the manner in which they were performed and presents the results of these runs. Material presented in this chapter encompasses what Banks and Carson call the third phase of a simulation study. According to Banks and Carson,

> The third phase concerns running the model. It involves steps 8 (Experimental Design), 9 (Production Runs and Analysis), and 10 (Additional Runs) [if required]. This phase must have a thoroughly conceived plan for experimenting with the simulation model. (3:15)

Prior to running the model for analysis purposes, the basic CASHFLOW model was run several times to ensure that it was working properly and that it did, in fact, realistically model the stock fund system. Output results, produced during this time, were reviewed to ensure that the ten daily average monetary effects on the RSD account balance added up correctly and that each day's ending balance was included in the next day's calculations.

After it was determined that the model was working properly, a decision was made to analyze the monetary results of an account that operated for one year, under the assumptions presented in Chapter Three and with an

additional assumption that the starting balance in the account was $0.

Run Number 1--No Beginning Balance

Since one of the assumptions about the system was that its annual debits and credits balanced, we wanted to see what would happen if no initial starting balance was provided and the account had to operate on its own without any prior money "in the pot". Twenty 12-month runs were performed under these conditions with the following results, as summarized in Table 8 and explained below.

TABLE 8
RESULTS OF 1 YEAR OPERATION WITH NO BEGINNING BALANCE

Run #	End of Year Balance	Lowest Balance	Highest Balance	Total # Days Neg.	Most Consec. Days Negative
1	$55,500	$ -4,700	$101,600	2	2
2	12,900	-18,600	114,800	30	11
3	-3,300	-97,800	40,600	251	101
4	166,300	-17,700	167,700	24	11
5	8,500	-46,100	83,200	89	76
6	54,700	-52,700	64,300	84	55
7	-54,000	-56,100	27,400	173	82
8	226,000	-17,800	231,500	19	17
9	106,900	-8,300	172,600	7	6
10	229,700	-3,900	239,200	3	2
11	153,800	-20,100	161,700	22	8
12	51,500	-24,600	91,700	50	32
13	50,000	-50,300	91,000	133	104
14	96,100	-8,000	146,100	12	3
15	78,900	-60,300	94,600	144	98
16	-29,100	-56,100	22,100	278	99
17	166,900	-6,900	166,900	8	3
18	180,900	-7,400	184,000	3	1
19	73,200	-31,400	67,800	189	52
20	283,400	-33,200	321,000	67	51

As stated above, twenty 12-month runs were performed under the assumption that the RSD account started the year

with a zero balance. As shown in Table 8, the account was in the red at some point during all twenty runs with the largest deficit occurring during run 3, when the balance dropped to -$97,800. Over all twenty runs, the average number of days per year that the RSD account was in a deficit status was 84.85 days or approximately 24% of the time. Averages and 95% confidence intervals for each of the categories presented in Table 8 above are shown below in Table 9.

TABLE 9
AVERAGES AND 95% CONFIDENCE INTERVALS
(RUN #1--NO STARTING BALANCE)

	End of Year Balance	Lowest Balance	Highest Balance	Total # Days Neg.	Most Consec. Days Neg.
AVERAGE	$95,440	-$31,100	$129,500	84.85	40.70
LOWER CI	$52,310	-$42,830	$93,350	44.76	22.16
UPPER CI	$138,600	-$19,370	$162,600	124.90	59.24

Run Number 2--A Beginning Balance of $100,000

The results of Run #1 helped determine how Run #2 would be programmed and how the model's input characteristics would be changed. The purpose of Run #2 was to determine a dollar figure that could be entered into the RSD account's initial balance that would keep the fund running without entering a deficit status.

The output results of Run #1 provided a dollar figure to use as an initial RSD account start up balance for Run

#2. It was decided that a dollar value slightly greater than the largest deficit the fund had experienced during Run #1 should be used as the start up balance during Run #2. Since the largest deficit the RSD account had experience in 20 1-year runs was -$97,800, an initial start up balance of $100,000 was used for Run #2.

The same assumptions that were followed in Run #1 were followed in Run #2. Additionally, all model characteristics were exactly the same in Run #2 as they were in Run #1 except that the starting balance in the RSD account was $100,000 instead of $0. Twenty 12-month runs were performed under these conditions with the following results, summarized in Table 10 and explained below.

TABLE 10
MONETARY RESULTS OF 1 YEAR OPERATION
WITH $100,000 BEGINNING BALANCE

Run #	End of Year Balance	Lowest Balance	Highest Balance	Total # Days Neg.	Most Consec. Days Neg.
1	$155,500	$95,300	$201,600	0	0
2	112,900	81,400	214,800	0	0
3	96,700	2,200	140,600	0	0
4	154,700	47,300	164,300	0	0
5	266,300	82,300	267,700	0	0
6	108,500	53,900	183,200	0	0
7	46,000	43,900	127,400	0	0
8	326,000	79,300	331,500	0	0
9	206,900	92,100	272,600	0	0
10	329,700	96,100	336,900	0	0
11	253,800	86,600	261,700	0	0
12	151,500	75,400	190,900	0	0
13	150,000	49,700	191,000	0	0
14	196,100	92,000	246,100	0	0
15	383,400	66,800	421,000	0	0
16	178,900	39,700	194,600	0	0
17	70,900	43,900	122,100	0	0
18	266,900	93,100	266,900	0	0
19	280,900	92,500	284,000	0	0
20	173,200	68,600	199,200	0	0

As the results of the 20 runs for Run #2 illustrate in Table 10 above, with an initial start up balance of $100,000 the RSD account maintained solvency and did not enter into a deficit condition, although at one point it did come close. During the third run, one of the daily balances within the account hit a low of only $2,200. Averages and 95% confidence intervals for each of the categories presented above are shown in Table 11 below.

TABLE 11
AVERAGES AND 95% CONFIDENCE INTERVALS
(RUN #2--$100,000 STARTING BALANCE)

	End of Year Balance	Lowest Balance	Highest Balance	Total # Days Neg.	Most Consec. Days Negative
AVERAGE	$195,400	$69,110	$230,900	0	0
LOWER CI	$152,300	$57,310	$195,300	0	0
UPPER CI	$238,600	$80,910	$266,500	0	0

The results of Run #2 show that with an initial start up balance of $100,000, an RSD account with the operational and financial characteristics of the account modelled in the CASHFLOW simulation model could operate effectively for the first year with an initial appropriation of $100,000. The results show that though the account hit a low daily balance of $2,200 during one of the 20 runs, the average low balance for all 20 runs was $69,110. In fact, the results indicate that 95 percent of the time the lowest balance in the account would be between $57,310 and $80,910.

Since the results of Run #2 showed that an account with the modelling characteristics described above operated effectively, this model became the base-line RSD model. This became the basic model that tested the effects of altering the input variables described below.

Altering the Input Variables

The CASHFLOW model, used to predict daily average balances within the RSD account, was based on many assumptions. In reality, however, many of these assumptions are likely to vary. Some of the key assumptions used in modelling the RSD account include the assumptions that the Due-Out Cancellation (DOC) rate will be 4 percent of the total number of demands and that the 12 percent surcharge on all DLR items will be generate enough cash to meet the cost of operating the division without requiring supplemental annual appropriations from the Office of the Secretary of Defense. If these two input variables change for any reason, they would have a substantial effect of the solvency of an RSD account like the one described by the CASHFLOW model.

Altering the Due-Out Cancellation Rate. One of the base-line CASHFLOW model assumptions used to predict future cash balances within the RSD account was that the Due-Out Cancellation (DOC) cancellation rate would be 4 percent of the total number of demands. While this percentage is a fair and reasonable estimate of what the overall number of

cancellations might be, it is subject to a number of conditions and could easily vary based on these conditions.

Under the previous, central appropriation method of funding DLRs, customers were not required to "pay" for these items when placing orders for them or when issued them. As stated previously, after final implementation of DMRD 904, customers will be required to "pay" for DLRs with available monies in their individual O&M accounts.

Since customers will be required to pay for DLR items when ordering them, their O&M money will in effect be tied up between the time the item is ordered and the time the item is actually delivered, issued and in use. Under these conditions and considering the high dollar value of DLR assets, it is very possible that customers would cancel on-order items with long lead times in order to obtain O&M account refunds so that they could order other, shorter lead time DLR assets.

It is also possible that customers might be directed to periodically cancel high dollar value DLR assets and use the refunded money to purchase a host of other items that, at a particular point in time, the "boss" might consider more important, politically practical, or even more desirable than DLR assets. In this case, items with long lead times, that had been on order and were projected to be delivered on a certain date would have to be reordered when the O&M money "became available."

In the event that either of the cases described above did occur, the projected average daily DOC cancellation rate of 4% would change and it would most likely increase. If the daily average DOC cancellation rate during the RSD account's first year of operation was 6 percent of demands instead of the projected 4 percent, the account would not be able to remain solvent with only the original $100,000 appropriation and would be in deficit status throughout the year.

If the daily average DOC cancellation rate was 6 percent of demands instead of 4 percent and all other input variables used in the base-line model remained constant, the average daily balance within the RSD account would continue to decrease by the amount of the additional DOC refund amounts. The results of a 2 percent increase in projected DOC cancellation rates, without additional appropriations into the RSD account are shown in Table 12 below.

TABLE 12
MONETARY RESULTS OF 1 YEAR OPERATION
($100,000 BEGINNING BALANCE and 6 % DOC CANCELLATION RATE)

Run #	End of Year Balance	Lowest Balance	Highest Balance	Total # Days Neg.	Most Consec. Days Neg.
1	-$599.7M	-$599.7M	-$1.57M	360	360
2	-$599.8M	-$599.8M	-$1.58M	360	360
3	-$599.9M	-$599.9M	-$1.57M	360	360
4	-$599.7M	-$599.7M	-$1.55M	360	360
5	-$599.8M	-$599.8M	-$1.57M	360	360
6	-$599.6M	-$599.6M	-$1.57M	360	360
7	-$599.8M	-$599.8M	-$1.57M	360	360
8	-$599.9M	-$599.9M	-$1.57M	360	360
9	-$599.9M	-$599.9M	-$1.58M	360	360
10	-$599.8M	-$599.8M	-$1.56M	360	360
11	-$599.7M	-$599.7M	-$1.57M	360	360
12	-$599.8M	-$599.8M	-$1.57M	360	360
13	-$599.9M	-$599.9M	-$1.57M	360	360
14	-$600.0M	-$600.0M	-$1.57M	360	360
15	-$599.9M	-$599.9M	-$1.56M	360	360
16	-$599.7M	-$599.7M	-$1.57M	360	360
17	-$599.9M	-$599.9M	-$1.57M	360	360
18	-$599.9M	-$599.9M	-$1.56M	360	360
19	-$599.9M	-$599.9M	-$1.56M	360	360
20	-$600.0M	-$600.0M	-$1.57M	360	360

As shown clearly in Table 12, without the infusion of additional appropriation dollars into the RSD account, with a 2 percent increase in the number of anticipated DOC cancellations, and with all other input variables remaining constant, the RSD account would continue to sink further and further into the red until at the end of the year, it would be approximately $600 million in deficit.

Adequacy of the Surcharge. It is anticipated that a 12 percent surcharge added onto DLR items will generate enough cash to meet all of the RSD division's obligations without requiring additional operating money from Congressional appropriations. If, however, any of the projected operating costs that were used to derive the 12 percent figure are

larger than expected, the 12 percent rate might not be sufficient to meet the division's expenses.

If, for example, depot repair costs are higher than projected or the support costs of the Cost of Operations (COD) division are higher than expected, the 12 percent surcharge might have to be increased or money generated from other sources in order for the RSD division to be able to effectively operate.

Assuming that one of the above mentioned costs were higher than projected and that the 12 percent surcharge did not generate enough cash to cover these increased costs, the RSD account's daily average balance would continually sink into the red, as happened when the DOC cancellation rate was higher than projected. This would occur because the account's "balance sheet" would no longer be in balance--debits no longer equalled credits.

Since the effective operation of the RSD account depends on the relative equality of its expenses and its income, any increase in expenses without a corollary increase of some sort in income would put the account in a deficit status. Any increase in income without a corollary increase in expenses would put the account in the black and would result in a steadily increasing account balance. In either case, a revolving account with too much cash or not enough cash is not the objective of good stock fund management. The objective is to have enough money in the account to meet expenses but not too much money in the

account sitting idle that could have been used to fund other items within the DoD. The stock fund manager's objective is to break even, and as we can see from the above simulation runs, this will be a difficult objective for RSD managers to achieve.

Chapter V, Conclusions and Recommendations

This chapter presents a series of conclusions and recommendations based upon the findings, presented in Chapter Four, and upon observations that presented themselves during the overall research process. The conclusions have been grouped into four separate categories; conclusions regarding the research question, conclusions regarding the investigative questions, specific conclusions, and general conclusions. Recommendations for each of these conclusions are presented immediately following the conclusion to which they apply.

Conclusions Regarding the Research Question

The research question, around which this thesis revolved, was "How will DMRD 904, Stock Funding Depot Level Reparables (DLRs), affect cash flow with the Reparable Support Division (RSD) of the Air Force Stock Fund (AFSF)?." The related conclusion and answer to this question are as follows.

DMRD 904 led to establishment of the RSD division of the AFSF. This division was created to support the implementation requirements of DMRD 904, which are innovative and complex. These requirements will also be difficult to adequately implement in accordance with the time line listed in the implementation plan and presented on page 33 of this thesis.

The operation of the RSD division will be dissimilar, in some important respects, to any other division in the AFSF. While the RSD will have many characteristics in common with other divisions of the AFSF, it will also have some important, unique characteristics of its own. Some of these include the establishment of surcharges to cover all operating costs of the division, the complex nature of the overall repair cycle process used to control and repair DLR assets, the high dollar value of DLR assets that will now have to be budgeted and paid for with unit O&M dollars, and the criticality of the effectiveness of this division due to the high priority nature of the assets managed within it.

Although it is unclear at this time exactly what cash flow within the RSD will actually look like, it is safe to say that it will depend on many, interrelated processes that have the potential to severely slow cash flow both into and out of the account. Cash flow within the RSD account will depend on the number and demand patterns of items required, the number and cancellation patterns of items canceled, changes in base level repair versus depot level repair capabilities, the health of unit O&M accounts, wing and maintenance unit commander's tendencies to use O&M monies appropriated for repair cycle assets for other things, the actual costs of items that surcharges are projected to cover, actual versus projected delivery patterns of both initial and replenishment assets, the timeliness of central appropriation account reimbursements to the RSD account, and

the effectiveness of data automation accounting systems to support RSD operations.

The dictates of DMRD 904 require operational procedures and funding mechanisms that could, if not monitored and planned for, limit cash flow within the account to the point that required DLR assets were not available to support mission requirements. There is a greater potential under the stock funding concept to run into support problems than existed under the central appropriation funding concept. There will be so many more people involved with the budgeting and expenditures for these high dollar assets that the probability for mistakes and mismanagement increases based on this fact alone. Additionally, the RSD operating system itself, with its interdependence on both the O&M account and central appropriation account systems, is at risk if either of these systems runs into cash flow difficulties.

Finally, as shown in Chapter Two, there were times throughout the history of the use of stock funds within the DoD that stock funding did not serve the department well as a funding mechanism. This resulted primarily from the lack of sufficient funds being infused into the account to operate effectively (normally appropriations) and the character of the inventory on hand (obsolescence, excess, etc).

All of the items mentioned above have the capability to influence the cash flow health of the future RSD division of

the AFSF. Exactly how they will do so is unknown, yet it is clear that they have the potential to severely limit cash flow and thereby effectively constrict DLR support to using organizations.

Recommendation 1. More data, related to the items discussed above, should be gathered and more fully analyzed in order to plan for coping with potential cash flow problems in the event that they do occur in the future. While future actual cash flow problems may not be exactly in line with these plans, at least there will be a plan (and more important a planning process) that has been accomplished. This plan, with certain revisions, could help solve cash flow problems faster and more effectively than if there had not been one.

Conclusions Regarding The Investigative Questions

In Chapter One of this thesis, the investigative questions were grouped according to those dealing with simulation model verification, those dealing with simulation model validation, and those dealing with other issues. The conclusions related to these questions are presented below.

As stated previously, it was verified that the CASHFLOW computer simulation model was functioning as intended and that all major elements that were projected to affect cash flow within the RSD account were contained in the model. Key personnel, responsible for the implementation of DMRD 904, have validated the key components expected to affect

cash flow within the future RSD account and have provided some of the data used to project this cash flow.

In addition to the initial investigative questions regarding computer model verification and validation, there were four other investigative questions regarding general system operating conditions. These questions are presented below together with their associated conclusions and recommendations.

The first question asked, "How well will the stock fund support customer DLR purchase requirements after the new funding procedures are incorporated?".

Customer Support. As stated above, the effectiveness and ability of the RSD account to support customer DLR requirements will depend upon a multitude of inter-related actions by not only RSD managers but also O&M account managers, central appropriation account managers, and wing and unit commanders. While the effectiveness of the new funding procedures have yet to be determined, it is clear that they do have the potential to degrade the support currently being provided to customers.

Recommendation 2. The same actions as stated above in Recommendation 1 are recommended here.

Running Out of Money. The second question asked, "Will the fund run out of the money required to purchase DLR assets?". Based upon the results of the simulation runs presented in Chapter Four, it is clear that the fund could run out of money as a result of many different influences.

Although close management attention and planning for possible contingencies will likely lower the probability of this happening, it does have the potential to occur.

Recommendation 3. In addition to recommending the same actions as those presented in Recommendation 1 above, it is recommended that a reserve "pot of money" of some sort be established in the event that the system, as designed, is unable to fund future requirements.

Possible Procedural Changes. The third investigative question asked, "What potential procedural changes could be made to improve the cash flow condition of the RSD account?". The answer to this question is that procedural changes that resulted in limiting the variability (and therefore the unpredictability) of items effecting the cash balance of the account, would improve management's ability to monitor cash flow. This improved ability to monitor cash flow could, in turn, lead to a higher degree of control over the account.

Items that will substantially effect the cash balance of the account and that potentially will have a high degree of variability include the Due-Out demand patterns (based in part on the use of O&M funds appropriated for DLR assets used for other things), cancellation patterns (based in part on the lack of O&M funds at different times during the fiscal year), turn-in patterns (based in part on changes in base level versus depot level repair capabilities), the actual costs of items that surcharges are projected to

cover, actual versus projected delivery patterns of both initial and replenishment assets, the timeliness of central appropriation account reimbursements to the RSD account, and the effectiveness of data automation accounting systems to support RSD operations.

Significant variations between what any these items are projected to be and what they actually are have the potential to significantly impact cash flow one way or the other.

Recommendation 4. Procedural changes that will result in limiting the variability of any of the categories listed above may result in improved cash flow within the account. Ensuring that vendors deliver RSD items, as originally contracted to do and budgeted for would reduce unexpected expenditures and place RSD managers in a better position to control the account.

Putting some type of limit on the ability of unit customers to cancel DLR items could result in lowering the number of cancellations that occur simply to temporarily replenish unit O&M accounts. Under current procedures, customers can cancel DLR items any time and for any reason--even if the asset is in transit and on the way to the customer.

Controlling data automation systems will be a key factor in the RSD manager's ability to effectively control the account. Limiting the variability in this area might mean control computer programming errors, ensuring ahead of time

that systems "connect" properly, and standardizing to the greatest degree possible the input formats, codes, languages, and outputs of associated systems.

The three suggestions presented above are only a few ideas that could, if further analysis warranted implementation, reduce some of the variability associated with RSD account cash flow. By controlling some of the controllable variability of items that will affect cash flow within the account, managers will have more control over it which, in turn, should lead to more effective management.

Will the Objective of DMRD 904 be Achieved? The fourth question asked, "Will the funding changes, directed by DMRD 904, actually result in increased operating efficiencies without decreasing readiness, as was the intent of the DMR committee's decision?". At this point, this question is difficult to answer. How the funding changes, directed by DRMD 904, will affect readiness will be a function of the ability of the account to meet its expenses and also the amount of obligation authority appropriated to it each year. Without the ability (obligation authority) to order a given amount of DLR assets, associated with a certain readiness level, parts will not be available no matter how much money is in the account. On the other hand, without money in the RSD, central appropriation, and unit O&M accounts, DLR assets might also be unavailable as required to support a given readiness level. The general conclusion, regarding this question, is the old axiom "time will tell".

Recommendation 5. The recommendation here is in line with Recommendations 1, 3, and 4 presented above.

Specific Conclusions

The following specific conclusions are a result of the data generated by the simulation runs in Chapter IV, Findings and Analysis.

The Initial Starting Balance. Based upon the results of the first simulation run, which was performed with an initial starting balance of $0, it is clear that in order for the account to operate effectively over a period of 1 year, some type of initial starting balance is required. Without an initial starting balance, even if the account's expenses equalled its income, an account with the characteristics described in Chapter III would enter into a deficit condition approximately 24 percent of the time.

Recommendation 6. The initial starting balance should be enough to meet worst-case cost projections for all categories of expenses within the account. The highest cost for each category of major expense, including depot repair, Due-Out cancellations (DOCs), and turn-in costs should be analyzed in detail to determine more accurate cost projections. These cost projections, in turn, should become the basis upon which the account's initial starting balance is determined.

Due-Out Cancellations. An increase in the historical numbers of Due-Out Cancellations (DOCs) should be

anticipated due to the funding changes brought about by DMRD 904 and the likelihood of customers seeking O&M refunds to reinvest in other purchases. The high dollar value of DLR assets alone will result in substantial decreases to the customer's O&M account as orders for DLR assets are placed. In fact, it is likely that DLR purchases will become the single greatest drain on unit O&M funds. For this reason, during periods of O&M cash shortages or for a variety of other reasons, customers may cancel DLR assets that have been on order for what they consider a long time in order to regenerate their O&M accounts and free up cash for other purposes.

It is possible that these cancellations could occur in spurts and peak during the end of each fiscal year, when O&M funds are traditionally low yet requirements remain high. If the O&M money appropriated for the purposes of supporting unit DLR requirements ($20-$30 million per wing annually) is used by the commander for other purposes (building upgrades, recreation enhancements, morale activities, etc) the O&M account managers, with their depleted cash position, might be more likely to cancel high dollar value items in order to buy other, less costly and more desired items. These cancellations could significantly drain the RSD account's cash balance.

<u>Recommendation 7</u>. Steps should be taken to ensure, to the greatest degree possible, that O&M account monies that have been appropriated for the purposes of

supporting the unit's DLR requirements are not carelessly expended for other purposes. If O&M monies are expended for other than their intended purposes, and a large number of DOC cancellations result in order to regenerate O&M accounts, the effectiveness of the operation of the RSD division will suffer.

Recommendation 8. Customers should curb their potential desire to cancel long lead time DLR items in order to apply the associated RSD refund to other purchases. If long lead time items are canceled for this purpose, re-ordering the item at a later date will most likely result in an even more distant delivery date. Canceling an item that is still required and, in effect, extending its delivery date, could upgrade some of these items to Not Mission Capable Supply (NMCS) status when, if they had been left on order, might not have been. Higher numbers of NMCS parts will, in turn, result in lower unit mission readiness due to the grounding of the unit's weapons systems.

Surcharges. Within the RSD division of the Air Force Stock Fund (AFSF), a great deal of trust seems to have been placed in the effectiveness of the projected 12 percent surcharge to meet all the expenses of the division--including the cost of repair, operations, and other expenses generated by the Cost of Operations Division (a new AFSF division whose costs and projected expenses have yet to be verified). The 12 percent surcharge might be able to cover the costs of the RSD and COD divisions if all the costs of

both of these divisions could be accurately projected. It does not appear, at this time, that they can be. Within the current data automation systems in use, much of this important DLR peculiar demand data does not exist or has yet to be stratified. It is hard to say how much to charge customers if you don't know what your operating expenses will actually be.

Recommendation 9. The 12 percent surcharge should be adjustable (in terms of the ability to change the rate) and flexible (in terms of the ability to quickly change the rate) if it is going to remain the only "outside" means of generating cash within the account. An adjustable, flexible surcharge might eliminate or modify some of the negative consequences of under-anticipated expenses.

Annual Appropriations. While it seems reasonable and perhaps commendable to operate a division of the AFSF without the aid of annual appropriations to make up for any shortfalls, it might also be impractical--especially during the early years of operation when costs, expenses and operating characteristics have yet to be established. Establishing a mechanism by which annual appropriations could be accessed, if required, might be a good idea. If the division experiences expenses that have not been projected and the effects of surcharge changes are too slow, a reserve pot of money, to be used only under these emergency conditions, might provide insurance against ineffectiveness.

Recommendation 10. A mechanism of some sort that would provide emergency funds to the RSD division should be established in the event the account could not meet its outlay requirements. Annual appropriations should be considered as one possible source of emergency funds, especially during the early, untested years of the division's operation.

General Conclusions

The following, general conclusions are a result of observations made throughout the research process and as a result of various readings, interviews, and discussions dealing with DMRD 904.

A Need for More Detailed and Coordinated Pre-Planning. Observations throughout the research process indicated that although boards have been convened and directives have been published to improve financial operating conditions within the DoD, some of the recommendations that provided the basis for these directives were not completely coordinated prior to submission. As a result, it is possible that the best recommendations were not submitted and the full impact of decisions that were made on the basis of less than optimal recommendations will have operational impacts that have not been considered.

Defense Management Review Decision (DMRD) 904, Stock Funding Depot Level Reparables (DLRs), which was issued in the fall of 1989, directed that both the Army and the Air

Force establish procedures to finance DLRs with their respective service stock funds. Doing so involved the establishment of service task forces, committees, and review boards who assessed current operating procedures and planned out complex and interdependent implementation processes. But, due to the complex nature of many of the DMR Committee's decisions, separate committees were established to handle and plan for each decision. This sometimes resulted in implementation plans, planned in isolation, that failed to consider the impact that concurrently evolving processes would have on the process being planned for.

In July 1991, there were so many significant and far-reaching processes and programming changes being directed that it was difficult to integrate and design a comprehensive plan capable of considering the dynamic interrelationship between these systems in their fully developed state.

Recommendation 11. A panel should be developed to monitor the inter-related nature of the most significant DMR Decisions not only within each service but within the DoD as well. This panel should be kept abreast of current implementation developments, relating to these DMRDs and inform interested parties of possible conflicts between them. For example, what might be considered an effective data automation improvement related to DMRD 904 might, at the same time, degrade the effectiveness of the implementation of DMRD 902. In this way, system designers

and developers could get a glimpse of the "big picture" and their part in it. Additionally, the likelihood of program "reversals" would be reduced and efficiency would be enhanced.

Putting the Cart Before the Horse. Many of the DMR decisions direct procedural and operational changes that, in order to be accomplished, depend up revisions to existing data automation systems or the creation of entirely new systems. These data automation changes, however, are difficult to achieve within the time constraints imposed by the DMRs. The extensive data automation support that is required for the effective operation of the RSD division will be a significant limiting factor. In the author's judgement, effective data automation systems will not be developed and tested in time to be used in support of DRMD 904's new operating procedures.

Many of the current, in use data automation support systems have programmatic problems and glitches that have long been identified but have yet to be corrected. Most data automation centers are backlogged with requests to fix these currently existing problems. While fixing identified programmatic problems is challenging in and of itself, designing entirely new systems or significantly altering others is even more challenging--and if done correctly, time intensive. Planning that operational and procedural changes will take place and data automation support systems will follow is putting the cart before the horse. The lack of

adequate data automation support systems will cause major RSD division management problems.

Recommendation 12. Effective, proven data automation support systems that will be used to monitor vital RSD management data should be up and running prior to instituting the procedural changes that will depend upon them. This may mean delaying or postponing phases of DMRD 904's implementation until these proven systems are in place.

Appendix A: CASHFLOW Simulation Model Programming Code

```
     SIMULATE
*    Define Ampervariables
*
     INTEGER    &CASH,&I,&J,&K,&CI,&CR,&ISSUE,&TURN,&DREP,&OUT,&CP,&WARR,&CANC,&SURCH
*
     LET        &CASH=0         Set operating cash in RSD account at $0
*                               at the start of the year.
*    Define Functions           (NOTE: dollar amounts are in hundreds)
*
*
 INITIALR FUNCTION RN(9),C2    Projected reimbursements to the RSD cash balance
0,18879/1.0,18935              for Initial Procurement items that are
*                              delivered during the first year.
*
 CASHIN FUNCTION RN(10),C2     Projected cost to RSD cash balance for initial
0,-18879/1.0,-18935            procurement is $1,877,972 to $1,893,528 per
*                              day 100% of the time.
*
 CASHR FUNCTION RN(11),C2      Projected cost to RSD cash balance for
0,-37787/1.0,-37842            replenishment deliveries is $3,778,722 to $$3,784,278 per day.
*
 REPAIR FUNCTION RN(3),C2      The debit to the RSD cash balance for Depot Level Repair
0,-65744/1.0,-65800            action. Daily average projected expenditures
*                              are between $3,671,917 and $3,677,472 100%
*                              of the time.
*
 ISS FUNCTION RN(4),C2         The credit to the RSD cash account for DLR items Issued
0,153611/1.0,153666            to maintenance customers. Projected average
*                              daily sales are between $15,361,111 and $15,366,667
*                              100% of the time.
*
 TRN FUNCTION RN(5),C2         The debit to the RSD cash account for DLR items turned in
0,-972194/1.0,-972250          either serviceable or unserviceable. The cost
*                              to the RSD cash balance is between $97,219,444
*                              and $97,225,000 per day 100% of the time.
*
 DUO FUNCTION RN(6),C2          The credit to the RSD cash account for DLR items ordered
0,833305/1.0,833361             by the maintenance customer. Projected
*                               average daily sales are between $83,330,556
*                               and $83,336,111 100% of the time.
*
 MDRQDR FUNCTION RN(7),C2       The debit to the RSD cash account for DLR items that are
0,-3045/1.0,-3100               deficient in some way and returned to
*                               supply under the MDR, QDR or Warranty Programs.
*                               Projected average daily expenditures are
*                               between $304,500 and $310,056 100% of the time.
*
 DOC FUNCTION RN(8),C2          The debit to the RSD cash account for orders that are
0,-33305/1.0,-33361             cancelled. Projected average daily
*                               expenditures are between $3,330,556 and
*                               $3,336,111 100% of the time.
*
```

```
 SUR FUNCTION RN(11),C2          The credit to the RSD cash account for surcharges
0,125215/1.0,125271              added to the price of DLR items. Projected
*                                average daily credits are between $12,521,559
*                                and $12,527,114 100% of the time.
*     GPSS/H Block Section
*
*       Generate Initial Procurement Expense
*
     GENERATE   1,,,,,1PF                Generate a daily $ effect on the account
     ASSIGN     COST,FN(CASHIN),PF       Assign value returned from INITIAL FUNCTION to XACT
     BLET       &CI=PF(COST)             Assign value of this XACT parameter to an ampervariable called &IN
     TRANSFER   ,SCASH                   Transfer the XACT to the block called SFUND
*
*       Generate Replenishment Procurement Expense
*
     GENERATE   1,,,,,1PF
     ASSIGN     COST,FN(CASHR),PF
     BLET       &CR=PF(COST)
     TRANSFER   ,SCASH
*
*       Generate Depot Level Repair Expense
*
     GENERATE   1,,,,,1PF
     ASSIGN     COST,FN(REPAIR),PF
     BLET       &DREP=PF(COST)
     TRANSFER   ,SCASH
*
*       Generate Aggregate Issues to Base and Depot Maintenance
*
     GENERATE   1,,,,,1PF
     ASSIGN     COST,FN(ISS),PF
     BLET       &ISSUE=PF(COST)
     TRANSFER   ,SCASH
*
*       Generate Aggregate Turn-Ins from Base and Depot Maintenance
*
     GENERATE   1,,,,,1PF
     ASSIGN     COST,FN(TRN),PF
     BLET       &TURN=PF(COST)
     TRANSFER   ,SCASH
*
*       Generate Aggregate Due-Outs Established
*
     GENERATE   1,,,,,1PF
     ASSIGN     COST,FN(DUO),PF
     BLET       &OUT=PF(COST)
     TRANSFER   ,SCASH
*
```

```
*        Generate Reimbursements for Initial Procurement Deliveries
*
      GENERATE   1,,,,,1PF
      ASSIGN     COST,FN(INITIALR),PF
      BLET       &CP=PF(COST)
      TRANSFER   ,SCASH
*
*        Generate MDR/ODR and Warranty Item Turn-Ins
*
      GENERATE   1,,,,,1PF
      ASSIGN     COST,FN(MDRODR),PF
      BLET       &WARR=PF(COST)
      TRANSFER   ,SCASH
*
*        Generate Aggregate Due-Out Cancellations
*
      GENERATE   1,,,,,1PF
      ASSIGN     COST,FN(DOC),PF
      BLET       &CANC=PF(COST)
      TRANSFER   ,SCASH
*
*         Generate Reimbursements for RSD Surcharges
*
      GENERATE   1,,,,,1PF
      ASSIGN     COST,FN(SUR),PF
      BLET       &SURCH=PF(COST)
      TRANSFER   ,SCASH
*
SCASH BLET       &CASH=&CASH+PF(COST)
*
      TERMINATE  0
      GENERATE   1       Run simulation for 1 day at a time
      TERMINATE  1       Run for 1 day at a time
*
      DO         &K=1,20
      DO         &J=1,12
      PUTPIC     FILE=BALANCES,LINES=6,(&J)
-----------------------------------------------------------------------------------------------------
SIMULATION OUTPUT (Part A):  Projected Reparable Support Division Cash Balances (in Hundreds) For Month Number **:
-----------------------------------------------------------------------------------------------------
Day    Initial  Replen.  Depot  DLR    DLR       MDR, ODR &  Due Outs    Cancelled    Reimburse.   Credit    Total RSD
Number Procure. Procure. Repair Issues Turn-Ins  Warr, TRNs  Established Items (DOC)  for Deliver. Surcharge Cash Balance
------ -------- -------- ------ ------ --------  ----------  ----------- ------------ ------------ --------- ------------
      DO         &I=1,30        Run for 30 days, 1 day at a time
      START      1
      PUTPIC     FILE=BALANCES,LINES=2,(&I,&CI,&CR,&DREP,&ISSUE,&TURN,&WARR,&OUT,&CANC,&CP,&SURCH,&CASH)

**    *******    *******   ******  ******   ******   *******   *******   ********   ********   ********  ***********
      RESET
      ENDDO               Finish for 30 day statistics
      RESET
      ENDDO               Finish for each month's statistics
      CLEAR
      LET        &CASH=0
      ENDDO
      END
```

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Vita

Captain Deborah A. Elliot was born 13 January 1958 in Nashua, New Hampshire. She graduated from New Milford High School, New Milford, Connecticut in 1976 with honors. In 1982, she graduated cum laude from Worcester State College in Worcester, Massachusetts with a Bachelor of Arts degree in English. Prior to earning her commission in October 1985, Captain Elliot served eight years in the United States Air Force Reserve at Westover AFB, Massachusetts as both a public affairs and social actions specialist. During her first commissioned assignment as Chief, Material Management Branch, 341st Supply Squadron, Malmstrom AFB, Montana Captain Elliot helped the unit win the 1986 USAF Daedalian Supply Effectiveness Award. After a year on station, she transferred to the 432d Supply Squadron, Misawa Air Base, Japan. Midway through this 3-year tour, she was named Chief, Operations Support Branch and helped the wing successfully transition to PACAF's Combat Oriented Supply Organization concept of operations. For her contributions to the success of simultaneous deployed and home base operations, Captain Elliot was named USAF Outstanding Junior Supply Manager of the Year for 1989. In 1990, she entered the School of Systems and Logistics at the Air Force Institute of Technology as a student of Logistics.

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REPORT DOCUMENTATION PAGE

Form Approved
OMB No. 0704-0188

Public reporting burden for this collection of information is estimated to average 1 hour per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden to Washington Headquarters Services, Directorate for Information Operations and Reports, 1215 Jefferson Davis Highway, Suite 1204, Arlington, VA 22202-4302, and to the Office of Management and Budget, Paperwork Reduction Project (0704-0188), Washington, DC 20503

1. AGENCY USE ONLY *(Leave blank)*

2. REPORT DATE
August 1991

3. REPORT TYPE AND DATES COVERED
Master's Thesis

4. TITLE AND SUBTITLE
THE EFFECT OF DEFENSE MANAGEMENT REVIEW DECISION 904, STOCK FUNDING DEPOT LEVEL REPARABLES, ON CASH FLOW WITHIN THE REPARABLE SUPPORT DIVISION OF THE AIR FORCE STOCK FUND

5. FUNDING NUMBERS

6. AUTHOR(S)
Deborah A. Elliot, Captain, USAF

7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES)
Air Force Institute of Technology, WPAFB OH 45433-6583

8. PERFORMING ORGANIZATION REPORT NUMBER
AFIT/GLM/LSM/91S-18

9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES)

10. SPONSORING/MONITORING AGENCY REPORT NUMBER

11. SUPPLEMENTARY NOTES

12a. DISTRIBUTION/AVAILABILITY STATEMENT
Approved for public release; distribution unlimited

12b. DISTRIBUTION CODE

13. ABSTRACT *(Maximum 200 words)*

This study investigated what the potential cash flow condition of the Reparable Support Division of the Air Force Stock Fund might be after final implementation of the procedures outlined in Defense Management Review Decision 904, Stock Funding Depot Level Reparables. The operation of the future Reparable Support Division was modelled using the General Purpose Simulation Software (GPSS/H) package and future cash flow conditions were projected through use of this model. Recommendations were then made based on the results of these projections and based on other data gathered during the course of the research process.

14. SUBJECT TERMS
Reparable Support Division, Air Force Stock Fund, Defense Management Review Decision 904

15. NUMBER OF PAGES
148

16. PRICE CODE

17. SECURITY CLASSIFICATION OF REPORT	18. SECURITY CLASSIFICATION OF THIS PAGE	19. SECURITY CLASSIFICATION OF ABSTRACT	20. LIMITATION OF ABSTRACT
Unclassified	Unclassified	Unclassified	UL

NSN 7540-01-280-5500

Standard Form 298 (Rev. 2-89)
Prescribed by ANSI Std Z39-18
298-102

AFIT Control Number AFIT/GLM/LSM/91S-18

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